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Statistical Co-ordination.

THERE are many things about Government Departments which are incomprehensible to the man in the street. Some of these are due to the apparent lack of co-ordination between the departments—each in its water-tight compartment seems to preserve its own individuality. That may in some cases make for good. To-day, however, when the truism "export or starve" is becoming a national shibboleth, it is important that we should be able to trace in every important industry the relation between external trade and direct unemployment in the industry concerned. Only by these means can we appraise claims for the protection which the Safeguarding of Industries Act is supposed to give.

At the outset, however, the student of statistics wishing to study the problem has to have recourse to two different publications—on the one hand, there are the Monthly Trade and Navigation Returns published by the Board of Trade about the eleventh of each month, and there is also the Ministry of Labour *Gazette* which appears about eight days later. The former gives some 200 to 250 octavo pages to import and export trade—the latter gives about 10 foolscap pages to employment. In the *Gazette* there appear each month for 100 industries the numbers of insured persons unemployed during the third week in the month. The monthly percentage figures are based on the estimated number of insured persons engaged in each industry in the previous July.

Our readers are familiar with the form of the monthly import and export trade returns and their division as regards imports into thirteen classes of electrical goods and apparatus, and one class of electrical machinery, and as regards exports the same classes of electrical goods and apparatus, together with three classes of electrical machinery. If, however, they will expend the sum of sixpence on the Ministry of Labour *Gazette*, they will find that three out of the one hundred scheduled industries are as follows:—

"Electrical Engineering," employing 71,530 persons; "Electrical Wiring and Contracting," employing 12,850 persons; and "Electrical Cable, Wire and Electric Lamps Manufacture," totalling 74,940 persons.

Considering that each of the last two progressive industries, while important contributors to our export trade, differ widely in the values of their exports,* and

* For the three years ending December 31st last, "Electric Glow Lamps" averaged £347,547 per annum for exports, while "Electric Wires & Cables, Insulated," have averaged £4,038,018 per annum for export. As regards imports, "Electric Glow Lamps" have averaged £215,029 per annum and "Insulated Wires & Cables" £970,385.

differ even more widely in their nature in the materials and in the processes involved, we should have thought that the Ministry of Labour would have distinguished between these two trades. We note among the smaller trades such items as "Heating and Ventilating Apparatus," employing 5,760 persons, or "Wall Paper Making," with 5,480 persons. Yet a lumping together of these last two minor trades—or their relegation to "Other Industries and Services"—would be less open to criticism than combining lamps and cables (including those for telephone services!). Perhaps the Ministry of Labour will study a copy of the Monthly Trade and Navigation Returns—later, possibly they and (or) the Board of Trade, might issue for each month a comprehensive summary of the imports and exports of the commodities most nearly related to the main groups under which employment is catalogued.

Government Departments can, of course, reply: "Wait for the publication of the returns for this year under the Census of Production Act." We concede that this information—when we get it—will give us the whole story for one year. Then in another five years there will be another census. But in the changes of the intervening years, with the monthly ebb and flow of industry, it does not seem reasonable to treat the respective industries of cable and lamp manufacturers as statistically inseparable industries, and deal with them in this manner when recording changes in employment.

Independent Arbitration in Contract Disputes.

Well over twenty years ago we made a practice in these pages of summarising and commenting upon selected municipal corporation specifications and the conditions embodied in them for adoption by manufacturers submitting tenders. One of the main points upon which we repeatedly laid emphasis was the importance of contractors insisting upon provision being made for the settlement of any disputes that might arise between buyer and seller, by an independent arbitrator and not by the engineer or surveyor who was necessarily the servant of the purchasing party. The publicity that the matter received led to improvement, as some of our readers, at any rate, will recall. But whatever may have happened then, it is obvious from recent proceedings that things are far from satisfactory to-day, for one of the outstanding subjects in recent joint deliberations of the manufacturers' section of the London Chamber of Commerce and the Federation of British Industries designed to secure improved conditions in the municipal contract forms is this tendency which still persists for local authorities to stipulate that disputes are to be settled by one of their own officers. Early in the year the two organisations named interviewed the Association of Municipal Corporations and submitted proposals for the adoption of the principle of independent arbitration, and it is now announced that the Association recommends municipal authorities to accept that principle "so long as it does not involve the construction of the agreement or any question of law, and so long as it is made clear that pending the determination of the dispute the contractor is not relieved of his obligation to supply goods or in other respects to perform his obligations under the contract." Another point that came under attention in the conference related to quantities of goods and where purchaseable during the continuance of a contract. This and the question of independent arbitration are both conditions which the London Chamber and the F.B.I. urge tenderers to insist upon when submitting offers.

The German Stinnes Group.

In our issue of June 9th we referred to a declaration made by Dr. C. F. von Siemens, who stated that the Siemens and Halske Company, the Deutsch-Luxemburg Bergwerks Gesellschaft and the Electricity Works Company (late Schuckert), which are united in the community of interests of the Siemens-Rhine-Elbe-Schuckert Union, had never had any economic or financial connection with, or had any dependency upon, the firm of Hugo Stinnes or the Stinnes concern, and that the firm was solely a shareholder in the one or the other company, with the rights of any other shareholder. No information was given at the time by the chairman of the Siemens & Halske Company as to the extent of the shareholdings of the Stinnes group in one or other of the associated companies, but according to a message published in London from Berlin as far back as May, 1924, large realisations had already then taken place of the Stinnes interests in the Siemens & Halske Company and in other companies, so that it was then doubted whether the Stinnes estate was any longer the chief shareholder in these companies. It was added that just prior to his death, Stinnes was apparently hard pressed for ready capital, and that his heirs had had to realise quickly to keep the rest of the undertakings running.

Among the latest developments in connection with the Stinnes estate, prominence has been given in the German newspapers during the past week or two to the interests which the late Hugo Stinnes held in the Rhenish-Westphalian Electricity Works Company, of Essen, which was originally established by him many years ago as a customer for his pits on the one hand, and on the other for the supply of a great industrial region extending from Cleve and Emmerich, on the Dutch frontier, as far as Dusseldorf and Cologne. As a great pit bank undertaking, the works has gradually grown to be one of the largest of its kind in the world, the shareholders including many local authorities whose districts are supplied with energy by the company. In March, 1921, the company entered into a fuel delivery agreement with the Rodder Lignite Mine, and about the same time took over for 99 years the management of three of the Stinnes pits—the Viktoria Matthias, Graf Beust, and Friedrich Ernestine—the supply company guaranteeing to the collieries a fixed rate of interest, while the latter gave the former an option to acquire the shares, so that the pits in question might eventually become the property of the electricity company. Apart from the shares held by the Stinnes' subsidiary companies in the electricity works, the direct holdings of the Stinnes interests amounted to 12,000,000 marks out of the total capital of 140,000,000 marks, of which the local authorities are said to have owned some 52 per cent. As it has been deemed necessary to realise these direct interests, and as no single buyer has been able to come forward, the Government of Prussia has stepped in and acquired the shares at a price which is understood to be equivalent to about the par value. The participation of Prussia has been partly prompted by the desire to strengthen the electrical interests of the State in the Western provinces and to bring about close co-operation with the State-owned electricity works, especially that in Hanover.

Since the preceding lines were written, further developments have taken place. These include the sale to London and American firms of the Stinnes shares held in the mines and iron and steel works owned by the Deutsch-Luxemburg Co., at 13,250,000 marks for the shares of 21,000,000 marks. The various banks which have associated themselves together for the liquidation of most of the Stinnes assets, have also disposed of the shares of 5,000,000 marks held in the Siemens and Halske Co., and of those in the Berlin Handels Gesellschaft; the sites in Hamburg have been taken over by the State of Hamburg, and the Stinnes timber forests and shares in the Westphalian-Anhalt Explosives Co. by the Prussian State, while the shares in the Barmen Bank Verein have been absorbed by other proprietors in that bank. All these transfers have had the result of redeeming about one half of the credits of 90,000,000 marks which had been granted by the banks down to last December.

The only comment which the situation of affairs seems to call for is an expression of surprise that it had been originally possible to obtain credit in so many quarters to take over and maintain large interests in such a num-

ber of undertakings to which it was absolutely impossible for any one individual to devote the necessary attention. Horizontal expansion or the amalgamation of similar undertakings has proved of great advantage to various German industries, while the lines of vertical development, or the association of interests from the production of raw materials to that of the most highly finished manufactures, has also been of benefit when not carried too far. But there is no doubt that the promotion of the latter system to extreme limits and in the particular form adopted by the late Hugo Stinnes has brought about the downfall of the estate and the loss of a considerable amount of money.

Italy—a Difficult Market.

It cannot be said that the report of the British Commercial Secretaries at Rome, with which we deal in this issue, holds out any encouragement to British exporters. Indeed, we are inclined to think that the authors are perhaps too pessimistic regarding British prospects, for although this country's share of Italy's import trade fell slightly during the past year, we retained our position as the second largest exporter to Italy. The authors, however, probably take the view that if we do not continue to increase our trade we shall be left far behind, and there is truth in this. All of our chief competitors in the Italian market made headway in 1924; Germany wrested the third place from France, while the United States remained the chief supplier and Czecho-Slovakia nearly doubled her share.

The principal factor militating against British trade with Italy would appear to be the rapid strides which Italian industry is making. In the electrical branch, it is stated, Italy is capable of producing the majority of her requirements and is becoming less and less dependent upon foreign suppliers; Italian electrical manufacturers, moreover, are beginning to emerge as serious competitors for the business of other countries.

In the Italian market, as elsewhere, price is a stumbling block to British manufacturers, and this is where Germany secures her main advantage. The report points out that the Italians cannot afford to pay a high price for a superior article if they can obtain one not so good but capable of fulfilling its duties, at a lower cost. Some competitors show a disposition to cut prices after ascertaining the amount of British tenders.

Mention is made of the establishment of factories in the country by foreign groups and the acquisition of controlling interests in Italian firms for the purpose of retaining business connections. In the face of these activities and of intensive German propaganda which is being carried on, British producers must continue their efforts to reduce prices to a competitive level, and to secure the interest of Italian buyers by a sympathetic consideration of their requirements. Personal contact is essential, and a real understanding can only be gained by representatives who have a command of the language.

Soviet Russia and Concessions.

In our recent leader on "Electrical Developments in Russia" (ELEC. REV., July 10th, p. 41) it was clearly shown that there was a growing appreciation that if the electrification of Russia was to proceed satisfactorily it was necessary to secure technical assistance from foreign works and to import more material from abroad. Subsequently it was reported that representatives were visiting this country for the purpose of expending considerable sums in the purchase of equipment and goods. A certain amount of business is being transacted in various ways at present, but it is a drop in the bucket compared with the requirements if electrification is to make headway. A *Reuter* dispatch from Moscow appeared in the London financial Press last week which credited Trotsky with views strongly favourable to the placing of concessions with foreign capitalist groups. He was addressing the German Labour Delegation with regard to Soviet "concession policy" and stated that the Government was more inclined than it was some years ago to "admit foreign capital to participate in the acceleration of the development of the technical and productive forces of the Soviet Union." He tried to impress capitalist groups with the advantage which they would derive by expressing a serious desire to acquire concessions. No doubt we have a long way to go before full recognition of past obligations will be forthcoming and therefore a long way to go before British capital will be prepared to run material risks, but the Trotsky attitude is worth noting as a straw showing which way the wind is blowing. The private property in Russia of British subjects is still considered as nationalised and confiscated. The Association of British Creditors of Russia in inquiring whether the Soviet Government's decree abolishing confiscation of private property is retrospective has reminded that Government that there are 500,000 individuals (company shareholders) who have been victimised and who will naturally be active agitators against any trading facilities being granted so long as restoration and redress are withheld. The Association holds, in common with the London Chamber of Commerce, the Association of Bankers and Credit Houses, and the Federation of British Industries, that "until Russia has settled with her creditors and thus restored confidence in her good faith, normal credit and industrial relations between the two countries cannot exist."

The Congress of Radiology.

TENTATIVE suggestions for the holding of an international radiological Congress have been made from time to time; in fact, gatherings of radiologists have taken place, but they have not been truly international in character. British radiologists must, therefore, be proud of the fact tnat they were privileged to organise the first International Congress of Radiology, which was recently held in London. That the time was fully ripe for such a conference is evidenced by the attendance of nearly 500 delegates, representing no fewer than twenty-one nations.

A large number of valuable papers were read before the three sections—radiology, physics, and electrotherapy—the attendance being greatest in the first-named, and reference may be made to two constructive features: the first is that steps were taken to assist in the formulation of an X-ray unit of intensity which will be internationally acceptable, and the second is a recommendation that international agreement on X-ray and radium protection should be secured.

Amongst the new apparatus and methods described, the application of actino-therapy in the treatment of many diseases, such as tuberculosis of bones and rickets, is of special public interest at the moment; lamps for the production of violet rays, or artificial sunlight, are being improved, and rapid development in this direction is likely to take place in the near future. In X-ray practice, the most important development is probably the introduction of apparatus capable of producing current at constant high pressures up to 250,000 volts. Greater efficiency must follow the use of such devices, for they will not only increase the precision with which the radiation dose can be administered, but also reduce the exposure time, with advantage to the patients.

Industrially, X-rays have many possibilities; they are used for the detection of hidden defects in many substances, and it is now possible to penetrate 4 inches of steel. To power engineers, Mr. C. N. Kemp's work on the application of X-rays in the technology of coal would seem to be of special significance, and it may afford a ready means of examining coal before it is put on the market. Mr. Kemp also emphasised the importance of introducing technical radiology as a distinct science and of providing more facilities for teaching it. There must be many ways in which X-rays can assist industry. At the same time, however, the exhibition held in connection with the congress clearly demonstrated that X-ray apparatus at present is not in the state it should be in to enable definite decisions to be formed upon industrial problems. Moreover, the price of such equipment seems to be unduly high.

Industrial Illumination.

By C. T. PAYN.

Of the numerous applications of electricity, electric lighting is certainly the most widespread, for, with the exception of small towns and villages, it is to be met with on every hand.

Illuminating engineering is not wholly a matter of the selection and location of reflectors so as to throw the maximum light from lamps in some predetermined direction. An intimate knowledge of such other factors as glare, shadow, quality (colour characteristics), illumination of surrounding surfaces, and diffusion is necessary before a lighting system can be intelligently planned.

The proper illumination of our industrial establishments has become a matter of prime importance to the manufacturer, the workman, and the State; and success and efficiency are largely dependent upon it. Many factories still have conditions of illumination that are seriously injurious to the vision and general health of the operative. Bad illumination is *always* a poor investment, and results in dissatisfied workmen, spoilt material, and reduction of output. There is now no excuse for an inefficient lighting installation. The art of light production and illumination has been brought to such a state of excellence that an intensity comparable to that of daylight conditions in an average factory is easily attainable. It is peculiar that manufacturers will provide their employés with the best of tools and equipment, and yet forget that the final efficiency of the machine depends upon the efficiency of the individual workman who is seriously handicapped by poor light, adequate illumination being essential if the best is to be got out of him. Employers are generally aware of the danger to the eyes which exists from mechanical injury, but apparently they do not realise the insidious nature of the harm which accompanies poor lighting. Impairment of vision is a slow process, and may take months or even years before the individual himself becomes aware of it. Good lighting is an investment, not an expenditure.

Some manufacturers spend a considerable amount of money on their lighting installations, but it is not so much a case of spending money as of making the best use of what is spent. Much is wasted on brilliant lighting, ill-adapted to the particular kind of work which is being carried on. In many cases the lighting bill could be reduced by half, and still give more satisfactory results, if the installation had received careful attention in all essential details.

The planning of an industrial lighting installation requires a complete knowledge of all the modern methods and apparatus for the distribution of light. As in the case of a power installation, a complete set of wiring plans should be prepared showing the best methods of distribution to all parts of the building, location of main switch (or lighting switchboard), building risers, and position of fuse boxes. The last item is of extreme importance, and should receive careful attention. The distribution boards should be located as far as possible centrally with the load they are to supply, so that long runs are avoided, and voltage drop reduced to a minimum.

There has been a great deal of discussion on general *versus* local lighting, but the former is fast superseding the latter, and the reason is not far to seek.

The intensity of illumination is of as much importance as its distribution. The eye is able to adjust itself by the contraction and dilation of the pupil to suit a very wide range of intensities, and we are fortunately able to see and distinguish objects with equal ease under very different conditions. Nevertheless, limits exist, and therefore it is important to realise that artificial illumination may as easily fail by providing too much light as by too little. Although the eye can adjust itself to suit many intensities, it cannot be adjusted to suit two different intensities at the same time. Unless, therefore, the prime requirement of approximately even distribution is realised, the eye, as it turns from one direction to another, is obliged to adjust itself to the new conditions. This not only produces fatigue and is injurious, but directly defeats the whole object of the illumination. Generally speaking, we do not want to indulge in more light where we do use it, but in more light where we do not use it—which is "General illumination."

General overhead lighting has a very wide application in industrial work. It is usual to divide the ceiling of the shop to be lighted into squares (or rectangles as near a square as possible), and to locate a unit in each. Where machines are grouped, in certain areas group lighting may be employed, and the units located with respect to them. It is, however, far better to employ a strictly symmetrical arrangement, and to illuminate the entire shop uniformly so that adequate intensity is available, regardless of the disposition of the machinery. In a modern industrial installation a re-location of entire departments is no uncommon occurrence. In assembly shops, benches are often located along the side walls, and for that reason it is

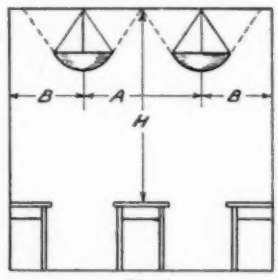


Fig. 1a.

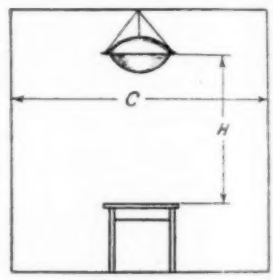


Fig. 1b.

advisable to locate lamps as near as possible to the walls. It is particularly desirable for a given total wattage to employ the least number of units which will provide the best illumination, as not only is expense in wiring saved, but larger lamps have a higher overall efficiency, *e.g.*, one 400-watt gasfilled lamp will give as much or even more light (light flux) than five 100-watt units. The problem, however, must be decided by the minimum number of units necessary to give uniform lighting and provide satisfactory illumination on both vertical and horizontal planes so that long, dense shadows will be avoided.

The following remarks will apply to all classes of lighting installations, and are the requirements generally met with:—

1. Sufficient light of uniform intensity on the working surfaces—vertical or horizontal.
2. A comparable intensity on all surroundings—walls, &c.
3. A light of suitable spectral character.
4. Light so diffused as to avoid objectionable shadows.
5. Freedom from glare.
6. The *ensemble* to be in harmony with the surroundings.
7. A suitable system of distribution which is reliable, simple and easy to maintain, the cost of which is not out of proportion to the results.

All these conditions must be satisfied if efficient results are to be expected. This can be obtained by one or a combination of the three following systems in general use:—

1. Direct lighting.
2. Semi-indirect lighting.
3. Totally indirect lighting.

In selecting the system, the characteristics of the shop to be lighted must first be considered. If the work is such that it is impossible to avoid large accumulations of dirt and dust, and if the tone and colour of the

walls and ceiling are dark in colour, indirect or semi-indirect lighting is to be discouraged. The colour of the walls and ceiling can, however, be remedied by the liberal use of paint and whitewash.

A few additional points which must be borne in mind are:—

1. Objects are seen by the light which they reflect, and dark objects require a higher intensity than those light in colour.
2. At least 20 per cent. higher intensity than that actually required should be allowed for when designing indirect or semi-indirect systems to allow for depreciation, due to the accumulation of dust on the reflectors, lower efficiency of the lamp as it gets older, and darkening of ceiling and walls.

On investigation of an actual installation, the following figures were obtained. The installation consisted of semi-indirect units, a once white ceiling and walls, to a height of 5 ft. 6 in. from the floor:—

	Ft./candles.	%
Installation as it stood ...	3.5	100.0
After cleaning units ...	4.5	128.5
Adding new lamps ...	5.25	150.0
Re-whitewashing walls and ceilings	6.5	185.6

In the case quoted above, the ceiling was very dirty, but the figures are significant.

In a new installation for a large general office, an average intensity of 12 f.c. was aimed at, and 11 obtained with the actual installation. After six months the intensity was down to 8 f.c., so that the high figure at the start was amply justified.

The following is a description of an interesting experiment conducted in the Demonstration Room of the B.T.-H., and is quoted from the ELECTRICAL REVIEW, dated July 27th, 1923. The apparatus consisted of a small box in which a cylinder was caused to rotate at constant speed. Letters are printed on the cylinder so

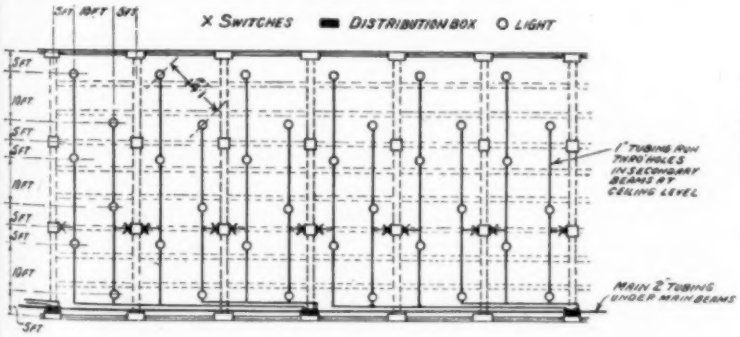


Fig. 2.

that they can be followed by the eye as it rotates. Lamps of various candle power were switched on at intervals, which produced the effect that the speed of the cylinder appreciably decreased as the illumination increased. This proves that the eye can see more quickly under high intensities. The article continues that the results of certain tests showed that production was increased by 10 to 25 per cent. with modern high-intensity lighting instead of the average standard.

Tables have been compiled from practical experience from which the spacing of the units can be determined. Table I has been used by the author, and has proved accurate in practice.

TABLE I.

System.	$\frac{C}{H}$	$\frac{A}{H}$	$\frac{B}{H}$
Indirect	1·30	1·50	0·6
Semi-indirect ...	1·15	1·50	0·6
Direct semi-enclosing ...	1·10	1·45	0·5
Direct	1·0	1·40	0·5

The meaning of the symbols can be ascertained from fig. 1.

The following is a brief description of an actual installation, in which the conditions are sufficiently common to warrant its description. As previously mentioned, the least number of units required to give a desired illumination should be used, but the proportions of the interior are very often such that consider-

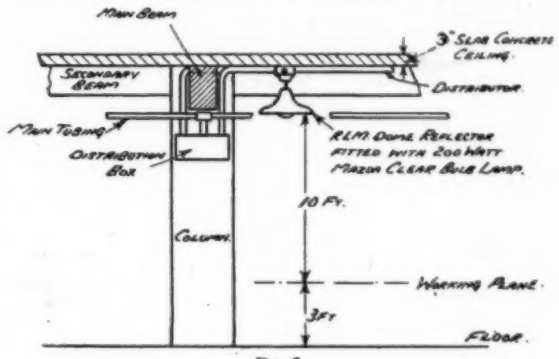


Fig. 3.

able planning is necessary. In this case the problem was that of 20-ft. square bays with deep main beams and shallower transverse secondary beams spaced 6 ft. 8 in. apart, with 1-in. diameter holes through them, as shown in fig. 2.

The correct position for the units was first ascertained, and plotted on the ceiling plan. Referring to fig. 2, the distance between the units (by calculation) is 14.1 ft. The nearest unit to the wall is 5 ft. 200-watt Mazda clear-bulb lamps of 191 m.s. c.p. were used. The reflectors, supplied by the Power Equipment Co., were dome-shaped polished enamelled reflectors (see fig. 3).

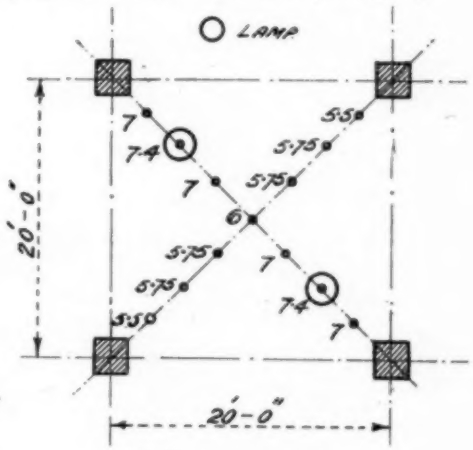


Fig. 4.

These were hung so that their edge was level with the bottom of the main beam; thus, unless the eye was cast directly upwards, all direct light from the lamps was cut off. The secondary beam, being only 1 ft. 1 in. deep, did not interfere with the distribution of light. Using Table I, it is found that such an arrangement gave the following ratios:—

$$A/H = 14.1/10 = 1.41 \text{ and } B/H = 5/10 = 0.5$$

This spacing being symmetrical and falling within the ratio limits, was adopted. As holes were left in the concrete beams 4 ft. either side of the main beams, the tubing supplying the lamps was run through them. If necessary, another unit (shown dotted) could easily be added, still retaining symmetry.

For distribution purposes the ceiling was divided into square sections of three bays long by three bays wide, a separate pair of feeders being run in the main 2-in. tubing under the main beams, which teed up into 10-way Parmiter, Hope & Sugden ironclad distribution boxes mounted on the side columns.

The photometer readings over one bay gave the foot-candle readings shown in fig. 4. The instrument used was a No. 167 Sharp-Miller photometer fitted with a No. 78B Wratten filter by Mr. Haydn Harrison, M.I.E.E.

The illumination thus provided was very satisfactory, free from glare, and shadows practically non-existent. The columns and walls were painted a dark green to a height of 5 ft. 6 in., thus avoiding surface glare on a level with the eye. The remainder of the columns and ceiling were whitewashed. The effect was pleasing and comfortable. In order to allow for extensions, all ceilling and through boxes were made 4-way, and spare outlets plugged. The switch lead, contrary to usual practice, was carried on and looped into each box in the run, so that in the event of partitions being erected, the lighting units could be shifted to suit the new requirements without disturbing the existing wiring. The unused switch-drops on the columns would be removed. The units were switched in groups of three. Throughout the installation standard material was used. All conduit, conduit fittings, and switches (ironclad) were supplied by Simplex Conduits, Ltd.; all fixing was made by means of Rawlplugs. Where necessary, the general lighting was supplemented by individual machine lighting.

In conclusion, a few words about "exterior lighting." Exterior lighting of industrial properties is required principally for the following purposes:—

1. The illumination of yards, thoroughfares, approaches, and passage-ways.
2. The identification and handling of materials stored out of doors.
3. The protection of buildings and materials against theft.
4. The guarding of boundaries against unauthorised persons.

Safety demands that any area which an employé is required to traverse after dark be adequately lighted. The requirements are more severe than for average street lighting, inasmuch as in emerging from a brightly-lighted building into the darkened area, the eye does not accommodate itself immediately to the lower intensity, and difficulty is experienced in seeing if this change is too great.

For this type of lighting the matter of shadows is of extreme importance, and deep, dense shadows must be avoided at all costs. If night work is carried on at all extensively in the yard, the intensity of illumination should be equal to that given for similar work in the building itself. The amount of light to be used as a protection for the building depends upon the importance of the property. A far greater use could be made to-day of flood-light projectors suitably erected on the angles of buildings. For general application, units having a beam spread of 30 degrees are most suitable. The ideal condition to be aimed at is a square space lighted by four flood lights, each unit so erected and trained that it covers the whole area; thus, even illumination is obtained, and shadows are eliminated. There is also the advantage of being able to focus the units on any desired spot, or to sweep surrounding areas.

The dome-type reflectors adapted for outdoor use are quite efficient, and give excellent protection from glare. Their cost is low, and except for occasional cleaning their upkeep is nil. These should be mounted not less than 15 ft. above the ground, and spaced apart about four or five times the mounting height. It is always preferable to increase, as far as possible, both the height and intensity of the unit. The ordinary cosine method of calculation of the intensity will be found sufficiently accurate in determining the illumination in foot-candles, which for general yard lighting should be between 0.25 and 0.75 foot-candles.

In conclusion, there are many classes of the public which have much to do with lighting, but understand little about it, and it would certainly be advantageous if the importance of the subject could be brought vividly before them, particularly in the education of works managers.

It is essential that better lighting should be used, and that the industry and the public should understand the principles of good lighting, and recognise the standards of intensity which are adequate and suitable for various purposes. Possibly much that has previously been written has been of a too technical nature to interest those not engaged in the industry. It is hoped that this article will prove beneficial both to employer and employed.

Testing the Boiler.

By "STAN DARD."

The new turbo-alternator had been duly tested and accepted,* and some weeks afterwards word went forth to the testing engineer that a representative boiler in the new boiler-house was ready. The testing engineer, whose logical soul always revolted at such upside-down tactics as testing the boilers *after* the machine, accordingly assembled his faithful thermometers and more or less devoted staff.

On this occasion he removed his coat and collar. His assistant donned a dust-coat with pockets for two slide rules. Some of the old hands on the testing staff almost reached a state of nature before encasing themselves in dungarees, finished-off by rag neckties. Two students, under the wing of the testing engineer, were in a state of bewilderment and subdued excitement. The news that the Test Dept. was preparing to do some work spread like wildfire through the power station.

Before the test proper started, an hour's preliminary run was ordered, and during this the observers were settled down at their posts. Outside the boiler-house the coal was taken from a truck and then wetted; the wetting was to aid combustion and make even fires. The coal was then heaped near the boiler, and sackfuls were weighed and emptied into the hoppers which fed the fires. One man was told off to check the weighing, with a student to assist.

* "The Acceptance Test," Nov. 28th, 1924.

Several six-foot ironclad thermo-couples were pushed through the boiler wall at various places, and leads from these ran down to a table behind the boiler; here a superior-looking tester took periodic readings on a milli-voltmeter, made mysterious corrections, and translated the results into deg. F. The remaining observer below was the second student, who was gratified by being given the job of reading the manometers on the induced-draught and the uptake to flue.

The boiler was isolated and was now fed from the hotwell of a turbine. Before the condensed steam from the latter was allowed to replenish the hotwell, it was measured; in this way periodical evaporation readings were given and the lb. of steam produced by the boiler accurately known. From the hotwell the condensate passed to the boiler. We can follow it aloft and see the remaining observers at work. Here, where the weather does not seem so cool, the height of the water in the boiler drum is taken; there are thermometer readings on the inlet and outlet of the economiser (where the water is heated up by the flue gases before entering the boiler), and on the superheater outlet, while a special gauge gives the steam pressure.

During the preliminary run other characters appeared on the scene. The chemist, a department in himself, crystallised out behind the boiler and rigged up an Orsat apparatus. With this he analysed samples of flue gas drawn from a sampling pipe inserted in the boiler wall. Then appeared the contractor's representative, this worthy having breakfasted after some early hours spent in the boiler-house; his bowler hat was dis-

carded in favour of a greasy little peaked cap—memento of his marine days. He at once addressed himself to a close examination of the boiler fires, peering with a coloured glass through all available spyholes.

A sudden bellow announced to all in general (and the firemen in particular) that the boiler-house superintendent had entered. This official was familiarly known as "Old B. H." Some said that the letters "B. H." referred not to "boiler-house," but "bull-head," while others believed that the initials stood for one of his favourite exclamations. "Old B.H." led a dual life. Outside the boiler-house he was prepared, in the coolest and most scientific manner in the world, to debate upon things like net calorific values; but as soon as he came into the region of boilers his nature seemed to change. He underwent a metamorphosis. When he was "steaming" he became a holy terror and could out-glare the fiercest fire. And now, as he stood on the heap of coal and slated a fireman, one of the testers remarked upon his "nice, kind face."

After the preliminary run, the testing engineer, "Old B.H.," the contractor's representative, and the shift engineer held a round-table conference behind the boiler. During the conference the testing staff retired to the laboratory, which, to the chemist's great indignation, was at once christened "the chemist's shop." Here the older hands gloomily regarded the prospect of the six-hours' test run. The tester in charge of the thermo-couples was looked upon with envy, and that gentleman went to some pains to impress all present with the onerous nature of his duties. One of the students, inquiring as to how the boiler fires were lighted, received various answers ranging from "a match" to "they never go out."

The chemist was now summoned to the conference and, with an uneasy glance at his burettes and beakers, he departed. At the conference a hot discussion anent the fires was in progress. The chemist's CO_2 figures made the contractor's representative flinch; he had already been staggered by intractable coal and poor steam conditions. "Old B.H.," being in the exasperating vicinity of boilers, found the utmost difficulty in remaining polite and technical. The conference was witnessed by the power-station cat, which, by some mysterious faculty, had mounted to the main steampipe. Deciding to take a short-circuit to earth, she leapt down *viâ* a grating and "Old B.H.'s" head. This brought the conference to a close.

Half-an-hour afterwards the contractor's representative announced that he had now persuaded the "biler" to pull itself together. The thermo-couples showed that the mean flue-gas temperature was up, and the steam pressure and temperature near specification values. Alf, one of the firemen, was specially co-opted to keep even fires on the chain grates. The testing staff, just commencing tentative attacks upon their lunch, reluctantly left the chemist's shop. When the coal in the hoppers was levelled-off to the test mark, the word "go" went forth; the first weighed sacksful of coal were shot into the hoppers, and the feed-water and other measurements began.

During the first hour or so of the test everybody was intent upon his job—the student on the draught gauges, for instance, developing such meticulous skill as to read-off the draughts with unheard-of accuracy. One or two little accidents marred the commencement. The thermometer at the economiser inlet was sat on. An observer, unaccustomed to ladders and gratings, fell several feet, but fortunately dropped upon a fellow-observer. Another tyro seized an innocent-looking pipe which actually was nearly red-hot. But all these were just part of the settling-down process.

To the inward joy of the contractor's representative, conditions gradually improved. The chemist reported that the CO_2 figure was round about 14 per cent., and there were only faint traces of CO: this meant that the fires were good—and they would yet be better! Moreover, live-steam temperature was above the specification figure of 680 deg. F. Across the mind of the contractor's representative there floated the magic and entrancing figure of 85 per cent.—the efficiency of which the boiler was said to be capable!

Alf the fireman, armed with his 10-ft. poker, industriously attended the fires. While the boiler-house super. was absent, Alf relaxed somewhat and evinced great curiosity about the scientific apparatus. His imagination had recently been stimulated by the appearance of some Lea coal meters, and he was still somewhat incredulous over the fact that you could weigh coal without the aid of weights. You can judge of his petrifaction when he now found that the long rods thrust into the boiler were *electrical* thermometers! And when the testing engineer peered into the fire through an optical pyrometer, Alf learned that you could *see the temperature*! As he dazedly raked away, the marvels of science made him slacken—till a formidable bellow and a rise of temperature announced the vengeful arrival of "Old B.H." Pulling himself together, Alf, with great presence of mind, removed the red-hot poker from the fire.

Presently an interesting announcement was made: the contractor's representative had arranged for a catering firm to provide refreshments "on the job" and outside in an Army hut. Proof was soon forthcoming in the appearance of a waiter (a waiter!!) bearing a tray, but a boiler blowing-off caused a sudden retreat. However, the refreshments were duly brought back and the response was gratifying. One fellow began to read his thermometer to two places of decimals, and the general opinion of the boiler began to rise. The good news anent the hut spread elsewhere. People with no connection whatever with the test "dropped in," and were entertained by the waiter-in-charge. The shift engineer put on his "going-home" collar and coat, and, closely followed by the power-station cat, left his office. Presently he returned looking extremely pleased with the world. That cat did not accompany him.

The news was heard by Alf, who seized a suitable opportunity and vanished. The waiter-in-charge had by now had all his standards of social status completely upset, and greeted Alf as though he were the owner of the power-station, while the cat directed a fixed stare at the intruder. Alf, with a firm grip on his sweat-rag, hesitated but a moment, and ordered beer and sausages. Meanwhile, "Old B.H." had left the boiler-house and critically examined the appearance of the smoke. Hardly had Alf been served when he felt a mighty roar shake the hut and saw a well-known face glaring through the window. Seizing his refreshments, he dashed out in the nick of time.

Soon, to the general relief (and particularly that of Alf and the observers up aloft), the end of the long test-run drew nigh. By now the steam had reached 710 deg. F., and the testing engineer had removed his waistcoat. The contractor's representative was in a state of benevolent satisfaction. The fellow i/c of the coal weighing and his worn-out student-assistant now bore striking resemblance to coal-heavers. The chemist filled his last sample-tins of coal and clinker, and took a final check on the flue gases. "Old B.H." made one more request for a furnace temperature, and fumed and blew-off while millivolts were corrected and then converted into understandable degrees Fahrenheit. The power-station buzzer sounded 5 o'clock, and soon afterwards, when the hoppers had reached the mark, the test-run drew to a much-appreciated close.

Many days have passed since then. The testing engineer and his lieutenant have wrestled with their B.th.u.'s and degrees and lb. of steam. The contractor's representative has called several times; this seems to have helped matters, for on his last visit the efficiency figure had passed the 80 per cent. mark. The coal analysis shows that the B.th.u.'s were not as prolific as they should have been, while there was rather too much unburnt carbon in the ash. Grave arguments about the higher calorific value have been heard. Meanwhile, the "biler" and its mates are hard at work, and "will take some shifting." The testing staff remain strongly in favour of the boiler, and continually refer to the unexpected appearance of the canteen and waiters.

External Trade and Unemployment in the British Electrical Machinery Trade.

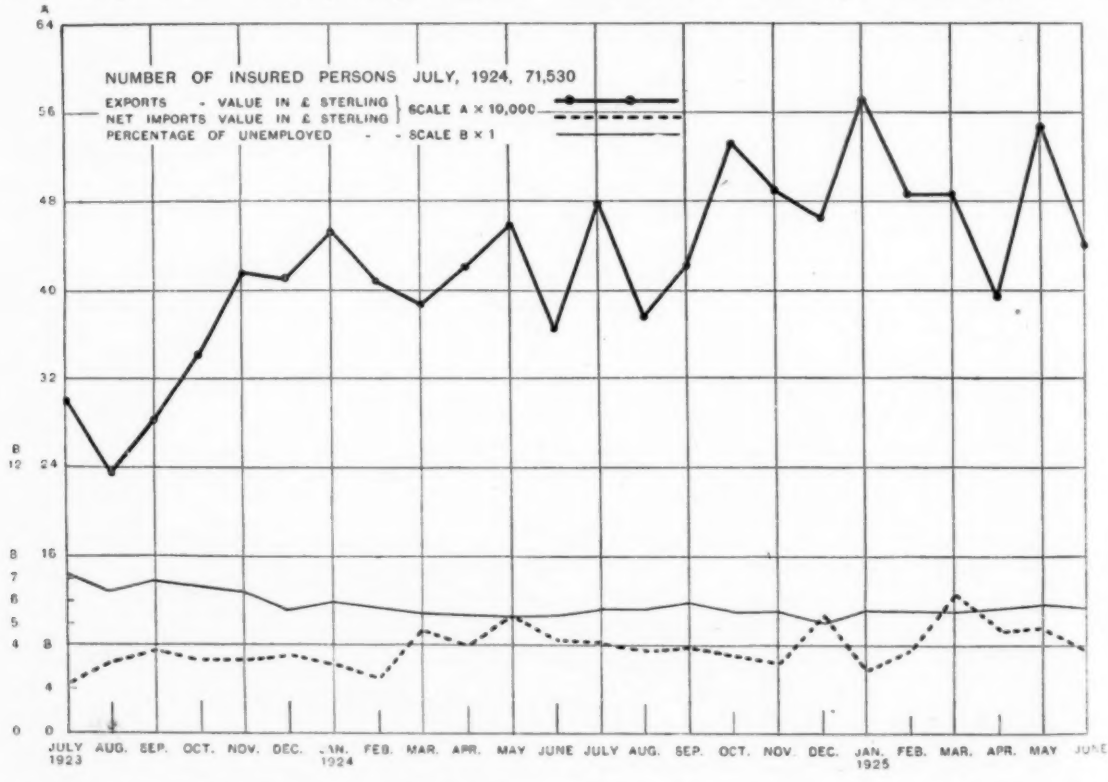
By W. P. DIGBY.

The student who seeks to appraise our tangled industrial conditions will find that, as regards the electrical machinery industry, a fairly exact co-ordination is possible between the amount of unemployment and the external trade. In the Ministry of Labour returns we have "Electrical Engineering" with 71,530 insured persons in July, 1924, "Electric cable, wire, and electric lamp manufacture," 74,940 persons, and "Electric wiring and contracting," 12,850 persons. It is with the first-named only that the writer is concerned in this article, which contrasts the unemployment figures with the exports and imports of railway and tramway motors and other generators and motors.

The monthly changes in the unemployment rate are set out in the accompanying figure. There have been no serious fluctuations—from July to December, 1923, there was a fall of 1.6 per cent.—thereafter the variations have been within one half of 1 per cent. of a mean figure of 5.5 per cent. Gratifying though it is, it is not the full measure of the healthiness of this industry. In July, 1923, the number of insured persons was 62,280; in July, 1924, there had been an increase of 11.5 per cent. to 71,530 persons.

The only regret that these figures can occasion is that other industries in Great Britain are not as well placed in finding employment for an increasing number of persons and in increasing the exports per person employed.

It is almost axiomatic that there are no industries so self-contained that their prosperity or adversity is without reaction on other industries. This is well exemplified in the electrical machinery trade; in addition to the primary employment within the industry itself, unemployment is reduced in other industries contributing the component materials such as pig iron or castings, steel forgings and castings, copper wire, core plates, and insulation. Further, an order for a generator for a steam-driven power station involves a prime mover, boilers, steam pipes, coal-handling plant, and very often structural steel for power-station buildings—electric cables and transmission line materials are necessary adjuncts, and even beyond these, lamps and electric motors. If the station is smaller and oil driven, there are internal-combustion engines and storage tanks with similar external adjuncts. If it is a hydro-electric power station, there is the need for water turbines of one type or another and pipe line material. As regards the water turbines, firms in the United Kingdom have built and are building machines many times larger than was attempted before the war.



The total imports in 1923 amounted to £906,111—in 1924 these had been increased by about £55,000 to £959,304 (*i.e.*, about 6 per cent.). Meanwhile the exports, which were £3,951,905, had increased to £5,262,581, or about 33 per cent. on a trade 4.3 times greater than the imports. The monthly variations both as regards total imports and total exports are shown in the accompanying diagram. Expressed per person insured, we have the following figures:—

Period.	Total imports per insured person. £	Total exports per insured person. £
1923 (whole year) ...	14.5	63.7
1924 (whole year) ...	13.4	73.6
1925 (1st half only)	7.13	42.4

Much of the healthiness of the electrical machinery industry is due to the Trade Facilities Acts. It is possible that no other single industry has benefited so largely in a direct manner. Indirectly the reaction is a widely-spread one. Without the benefits of the Trade Facilities Acts, not only would there have been a different state of affairs to chronicle in the electrical machinery trade, but matters would have been slightly worsened in other trades. It is to be hoped that the Treasury will bear this in mind as and when further applications are made involving electrical plant.

The Manchester Mining Exhibition.

A Brief Review of the Electrical Apparatus Displayed.

(*Concluded from page 168.*)

Messrs. Switchgear & Cowans, Ltd., exhibited a fine range of ironclad oil-immersed switchgear. In the draw-out type section a three-panel board for pressures up to 3,300 volts and line currents up to 60 amp. was shown. All actuating coils, trip mechanism, and meter transformers are within the oil tank, and a supplementary gland is provided, by means of which a bitumen cable can be sealed below the point where the cores are splayed out to fill up any cracks in the bitumen insulation. Examples were displayed showing non-drawout switchgear (fig. 5) for wall and floor mounting, and of 3-phase oil-immersed gate switches (fig. 6), with time-limit overload and the Williams-Rowley protective system for ensuring adequate earth continuity up to the coal cutter. The gate switch will trip and cut all pressure off the motor and training cable in the event of the earthing becoming inefficient, the trailing cable becoming damaged, or any attempt being made to withdraw the pommels from either coal-cutter or gate switch. The plugs and sockets are massive, with self-aligning plug contacts, and designed to prevent the trailing cable being pulled out of the pommel or the pommel out of the socket. Ironclad air-break switchgear is shown in fig. 7; all "live" parts are carried on mild-steel bars covered with insulation on the "metal-mica" principle. The units comprise switches, fuses, and bus-bar chambers, and can be assembled to form boards of any number of ways. The fuse handles (fig. 8) are composed of a heat-resisting, non-hygroscopic, moulded material of greater mechanical strength than porcelain, and the fuse contacts, which are self-aligning, are very readily removed for replacement. The fuse wire is carried in a removable baffle chamber, where the arc is split up and discharges through vents so disposed as to cool and damp the flame. Two sizes of induction-regulating or boosting transformers were exhibited, of 10 and 25 kVA capacity, in addition to colliery transformers for tapping a single-phase lighting circuit off power mains. The latter are flameproof, oil-immersed, and controlled on the primary side by a d.p. oil switch with oil fuses. The fuseholders are withdrawable by raising a hinged lid interlocked with the switch movement so that no live parts can be touched.

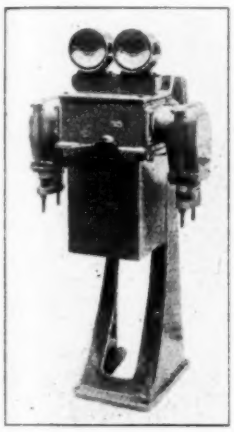


Fig. 5.—S. & C. Non-drawout Switch.

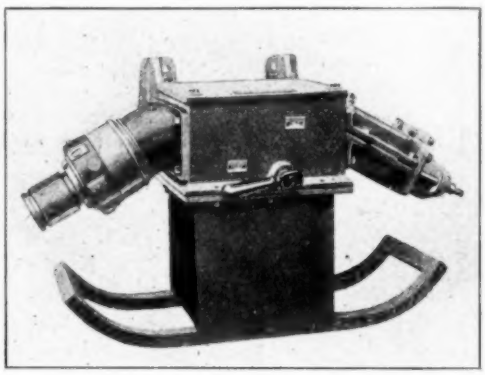


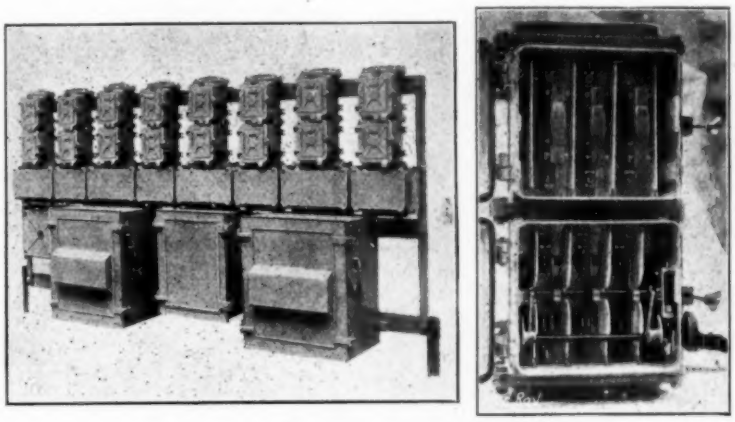
Fig. 6.—S. & C. Gate End Switch.

Alkaline Miners' Lamps, Ltd., exhibited electric safety lamps with alkaline batteries, and it is interesting to record that the Pearson-Nife lamp manufactured by this firm has been selected by the Government of New Zealand for use in the State mines.

The Ceag Miners' Supply Co. had on view the latest form of the lamp which won the Home Office competition in 1912. One of its features is the safety fuse device which, in the event of the well-glass breaking, at once disconnects all exposed "live" parts from the accumulator. The new 4-volt lamp (fig. 9) was also shown; the two "Ceag" circular accumulators are carried in a cast aluminium case, and all connections are made by contacts in the lamp top, which is an aluminium casting hinged from the case. The contacts are of the unit insulator type, so arranged that they can be quickly moved and the interior fittings removed in the usual manner by the bayonet-type ratchet retaining ring. The c.p. of the lamp is 12 in the forward direction and 4 c.p. all round when the reflector is not used. Various units of lamp-room equipment, such as charging stands, running tables, combined switch and magnets, &c., were on view.

Mes-rs. Mavor & Coulson, Ltd., showed a variety of coal-cutters; amongst them mention might be made of the "Universal" chain machine, "G" size, with 4-ft. jib, driven by a 3-phase motor, and the "Samson" disk cutter arranged to undercut 3 ft. 6 in. There were also a patent electric putter and conveyors and mining switchgear.

Messrs. Oldham & Son, Ltd., showed a variety of safety lamps, batteries, and stone-dusting appliance, together with other mining specialities. The exhibits were housed on two stands, a feature of one stand being the model lamp-room, containing a complete range of lamps and equipment as in every-day use, with a system of checking and accounting both for lamp-room and office records. On the other stand was shown in detail the evolution of the Oldham lamp from its commencement about 15 years ago to present-day types, including the newest 2-volt hand lamps. An interest-



Figs. 7 and 8.—S. & C. Air-break Switch and Fuse Gear.

ing exhibit was a working model of a boy operating a machine for removing and replacing accumulator lids. Although it has not been on the market more than about 18 months, Messrs. Oldham have sold over 100,000, and of this number over 30,000 have been supplied during the last six months. Another interesting item on the stand was a bulb-testing device, an arrangement which tests miners' electric lamp bulbs for shock, candle power, amperage, &c.

Messrs. Hugh Wood & Co., Ltd., exhibited the "Jeffrey" 24-A combination longwall-arcwall electric

Fig. 9.—"Ceag" 4-volt Miner's Lamp.

coal cutter, by means of which 20 headings, each 15 ft. wide and 6 ft. under, can be cut in a shift and over 1,000 yards fitted.

Messrs. Anderson, Boyes & Co., Ltd., showed an interesting range of coal cutters, chief amongst which were arcwall and longwall disk machines. Some of their mining switchgear was also shown.

Messrs. Beckett & Anderson, Ltd., had a large display of haulers. An interesting one was the new 5-h.p. main rope hauler, with internal gear in an oil bath; the drum carries 200 yards of $\frac{3}{8}$-in. rope, and the operation is similar to that of the well-known "Becander" 10- and 30-h.p. standard gear drum haulers. Fine adjustment and variation of speed can be attained with this machine, and as well as working into colliery dips it can be used for various purposes in other trades.

The Harland Engineering Co., Ltd., showed one 350-h.p. horizontal pumping set; the motor is 3-phase, 50-cycle, 3,000 volts, 1,500 r.p.m. There was also shown an E.F.V. 6½-30 h.p. motor, 3-phase, 50 cycles, 440 volts, 1,000 r.p.m., and part of this stand was occupied by the Rheostatic Co., Ltd., which displayed

Fig. 10.—"Oldham" Miner's Lamp Lid-removing Device.

to good effect "Service" resistances, including air-cooled colliery resistance with a metal-mica terminal bar and boiler plate terminal chamber. There was also an oil-immersed resistance with an accessible terminal bar and corrugated explosion-proof tank.

The Lancashire Dynamo & Motor Co., Ltd., had a 45-kW motor-driven alternator set in operation, supplying power to many of the exhibitors. One 30-b.h.p. and one 50-b.h.p. flameproof slip-ring inductor motors, with explosion-proof covers over the brushgear, were shown as tested and certified under fiery mine regulations. There was also a 20-b.h.p. "Maxtorq" motor and a separate display showing the construction of its rotor; battery charging sets and other standard products completed this exhibit.

House Wiring at So Much per Set!

A Revolutionary Suggestion at the I.M.E.A. Convention.

By E. G. ROSS, A.M.I.E.E.

MR. L. L. ROBINSON, of Hackney, struck a new note in the somewhat remarkable paper he read before the I.M.E.A. recently. He said, in effect, that he would like to see the time arrive when any man would be able, at will, to buy his own wiring installation, all ready to put together, just like a set of wireless components packed up in a box. To a certain section of the electrical trade this must have sounded like rank heresy; yet, from the report of the discussion, few, if any, of the subsequent speakers appeared to realise the significance of Mr. Robinson's words. Was this wilfully so, or inadvertently so? It is worth while to devote a few moments' consideration to the matter, as it is really suggestive of something revolutionary in electrical commercial practice.

Primarily, all must agree that, to the average man in the street, the *installation* of electricity in his home is a serious matter. Just now, to put in a decent installation costs him from £20 to £30, and this does not cover anything of an elaborate nature; rather the reverse, in fact. The rapid growth of municipal hire-purchase schemes is tangible proof of the desire to use electricity, but, simultaneously, is a very plain demonstration that the average man simply cannot, or will not, pay for the installation part of the business as a preliminary to the use of the power. The fact that he is willing to "pay as he goes" is a clear indication that he does not see why the means to use electric power should be also the means of depleting his pocket, in addition to the cost of the energy itself. He realises

very well, as the increasing sales of irons, table lamps, luxury fittings, &c., demonstrate, that he must pay *something* for the apparatus necessary to use power, but why a man's long time, plus a heavy shop oncost, plus an outside profit, should be charged to him is beyond his comprehension.

It must not be forgotten that, to the layman, the term "supplier of electricity" covers everything in connection with electricity, and the position of the contractor is more or less vaguely defined in his mind. Thus, when he applies for a supply of energy, he has the feeling that it should be put in free, or, at least, at a nominal charge. The fairness of this is, of course, debatable, but is not of moment here. Many years of gas companies' activities have brought about this state of affairs, since, when the present average house was built, gas was installed as a matter of routine conconstruction. Any expense due to the gas installation has either been very small as money values go to-day, or has been so camouflaged that the consumer did not, and does not, realise a direct charge upon his means. Thus, for example, his rent, say, covers the first cost in certain instalments, and so on. With the newer houses, of course, electricity is now having a similar look-in, but the experience of years of gas will take much eradication. And here again, the first cost of the electrical installation is no mean item in the fixing of the rent. In certain large municipal housing schemes north of the Tweed the following rents obtain:—

Coal-fired house with electric light and gas boiler	£37
Same house, but "all electric" ...	£42

This is despite the fact that the all-electric scheme does away with the building-in of fireplaces and awkward vents! It certainly does seem absurd that the comforts of electricity should mean an increase of about 13½ per cent. in rent. The difference, perhaps less a small amount, is made up by installation charges and expensive utensils, *e.g.*, cookers, fires, kettles, &c.

Then, again, there exists a rooted dislike to "men coming in to make a mess." For this reason it is quite the thing in these days for a man himself to do odd jobs about his home, if time permits. If he is handy at all, the modern householder paints, papers, mends leaky taps, &c., himself, rather than have anyone enter his private precincts. Cost, of course, probably enters here too, but the point to be noted is that, to the householder, all such work is "jobbing" work, and as such "is better done by myself." Hence, at present, the wireman is largely regarded as a necessary evil before he commences work at all. If he does make a mess, the sooner he finishes it the better. Much worse is it when, having finished the job, he leaves the householder a budget of extra expense for getting walls patched up and repapered, or the family piano choked with lime dust. While the average electrician hardly goes so far as this, yet it is a fact that many a wireman leaves a memorable trail behind him. All this affects profoundly the most vital person of all—the housewife. If she, who really does the using of the power, is prejudiced at the beginning, how much less easily will she be guided to a proper appreciation of all that electricity really means! But even she, if father can hang a picture without smashing his thumb, will be satisfied if father can likewise install "the electric light" without causing her undue inconvenience. Despite much talk, it is thought that many electrical people do not yet realise that the person expressing the keenest desire "to do it by electricity" is the housewife—and she really does believe in the average husband's capabilities, however much he may be dubbed "dud," "curbstoner," or any similar term.

From the trade point of view, the householder is unskilled, and, as such, ought not to be trusted to do wiring work. This idea, however, has largely become ingrained in trade minds through the activites of the "dud" contractor, whose slapdash work is the result of desperate price cutting coupled with sheer stupidity. But if the householder can procure good and suitable *material* at a fair figure, the question of price cutting does not arise in his case, and he is not, on the whole, a stupid person. The average man can be just as smart with his hands as can the wireman. Until now he has not been shown the "how" of wiring, due to natural economic and commercial circumstances. For example, he never enjoyed the hand and eye training in his younger days that his son does nowadays, nor, until the advent of the comparatively cheaply-obtained motor-car, did he have the opportunity of turning his thoughts in a mechanical direction. Further, the lack of public electrical education has made him, until now, hesitate to take on the job of wiring his own house.

All this is changing, however. The public is now waking up to the fact that electrical wiring is not such a big job as at first it appeared to be. Slowly, but with ever-increasing momentum, the public mind is broadening to electricalities of all kinds, perhaps most noticeably in the matter of wireless. After nearly three years of broadcasting, quite a large section of the populace understands clearly the principles governing the lighting of a valve, irrespective of its other functions. Another large section is fully conversant with motor-car lighting, &c. From this it is but a simple step to the house lamp.

Again, various technical schools have instituted "trade classes," which are largely attended by other than general technical students. Indeed, the student who is wiring every hour of the day rarely attends a wiring class; he goes to something more advanced. The trade class is known to be a favourite resort of handymen, old and young.

Thus, the fear of an electric shock is only a temporary phase in domestic wiring development, and even now an observant eye will notice, especially among, and inside, out-of-the-way ironmongers' and painters' shops, modest notices advising clients that estimates can be given for any size of electrical installation, or instructing them to "Electrify and paint together: it saves mess," and so on. This is particularly noticeable in the establishment of the "general domestic engineer," a comparatively new profession, which appears to have originated in furniture emporiums and the like. Possibly many of these people depend upon a genuine electrical contractor; possibly not; but the fact remains that they, at least, are beginning to regard house wiring merely as a side-line to tempt the householder.

Perhaps the most eager electrical tyro is the average schoolboy. Wireless mad, say, he can teach many of his superiors the rudiments and practical details of electrical continuity, insulation, &c., &c. What must be the result? In the course of a few years the ordinary house circuit will simply be regarded as a matter of course, instead of a shock bogey. The other rule comes in too, *viz.*, the rate of growth of a body is proportinal, . . . &c.

It seems inevitable, therefore, that domestic wiring will actually descend (?) to the level of mere jobbing, which will further accentuate the point previously raised anent the cost of installation. It seems, indeed, that the latter will decline through force of economic circumstances alone, *i.e.*, without any attempt to make it do so as a matter of normal trade competition.

To meet this future condition, then, it would appear that it is now time to set about, in earnest, the simplification which must come. This does not mean, of course, that there has not been a movement towards simplification already. There has: new surface-wiring systems are advertised every now and then with notable regularity, each new system claiming to simplify this, or eliminate that; but these systems have not been evolved to meet the consumer's point of view. They have been evolved through force of trading circumstances. Has anyone yet seen an advertisement stating the advantages of the "X wiring system" to the consumer? To the contractor, yes; but to the consumer, no.

This order must change, for, as the consumer becomes more educated electrically, he will become quick to appreciate the said advertised advantages at their face

value and naturally will turn them to his own use in so far as he is mechanically able to do so; which ability, since surface-wiring systems require few tools other than a hammer, screw-driver, drills, and pliers, will approach within reasonable distance of the skill now used by the average wiring electrician, who will perhaps only be superior in the fitting-up of the heavier tube and industrial installations, which, of course, will not concern the householder at all.

From this it will be seen that two main conditions will arise, *viz.*, (*a*) There will be an insistent demand for a very simple "boxed-up" wiring outfit, which, if *not* supplied, must lead (assuming present legislation to continue) to (*b*) home wiring on a large scale by the semi-skilled (?) using material not suited for use by them. We unfortunately know already what the real (*b*) means! At present we have many instances of deliberately scamped work, but in future the scamping (if any) will be much less deliberate than unconscious, which is perhaps worse. It will then be clearly in the interests of the community, as distinct from those of the trade, for the trade to produce and supply to the semi-skilled, the "boxed-up wiring set," ready suited to their needs.

How such a "set" will be put up will, of course, depend upon many factors, not the least of which will be the amount of standardisation admissible from various points of view, the factor of safety allowable by rules, &c., the best method of fixing cables and fittings, and so on. Possibly such systems in general will embody:—

(*c*) Non-metal-sheathed cables (to remove the vexed question of earthing), made with fixing lugs integral with the insulation and holed to take a screw.

(*d*) Light fittings ready wired complete, with suitable externally fixed ceiling roses, &c.

(*e*) Moulded non-metallic distribution boxes externally fixed and arranged one per floor or per standard section of wiring, and therefore

(*f*) standard fuses,

(*g*) switches, plugs, joint boxes, &c., all moulded to abolish the present wooden blocks, &c., and to allow of external fixing, and also so arranged inside that all cable holes and terminals are easily accessible from the top,

(*h*) main switch and fuses supplied and fitted by the supplier of energy,

and so on—to detail everything would require a separate article. The point is that, as an ordinary manufacturing proposition, the scheme is feasible enough. The difficulties will arise outside the factory, perhaps notably in the various policies of supply authorities, contractors, insurance companies, and the like. But that at the moment is by the way. As a commercial matter, the revolutionary (and evolutionary) character of the "wiring outfit" will cause quite sufficient disturbance to bring all points of view to the fore. The industry is healthy enough to stand up to either praise or gnashing of teeth with regard to any of its activities, and if the present remarks tend to focus attention upon a potential development of wiring, then so much the better.

The Daventry Broadcasting Station.

Official Inauguration of High-Power Plant by the Postmaster-General.

ALTHOUGH somewhat inaccessible geographically, the new high-power station of the British Broadcasting Co., Ltd., will well repay the time expended by those privileged to visit it. It is the latest of the 20 B.B.C. stations (9 main, 10 relay, and one high-power) and will take over the functions of the Chelmsford experimental plant, retaining, however, the familiar call signal, 5XX, and wave length of 1,600 metres.

The programmes will continue to be relayed from the London studios by means of a Post Office land line, but a small studio has been provided in the station buildings for use as occasion arises. The inaugural ceremony was performed on July 27th by Sir W. Mitchell-Thomson, H.M. Postmaster-General.

Situated on Borough Hill, Daventry, in Northamptonshire, at an average height above sea level of 650 ft., the two masts are each 500 ft. high, giving a total effective height of 1,150 ft. Each is a triangular lattice structure stayed at each angle by seven guy ropes, twenty-one ropes in all, both the foundation of the masts and the anchorage of the ropes being concrete blocks. The distance between the masts is 800 ft., of which 600 ft. is occupied by the aerial and two 100-ft. lengths by the supporting cable. The aerial is of the T-headed variety, and consists of 10 wires supported in hoops 5 ft. 6 in. in diameter.

The down-lead is a six-wire cage, and enters through the roof of the station. The ends of the aerial insulators, which are of porcelain and approximately 5 in. long, terminate on the live side in anti-corona rings. Winches are provided at each mast in order to lower the aerial for periodic inspection without necessarily having to climb the masts, which feat is reported to occupy 20 minutes to accomplish. The location of the aerial is approximately N.E.-S.W. On the platform of each mast is provided a bowl-shaped warning light for aircraft. Each bowl contains four lamps, two of which are in use alternately and two as a standby.

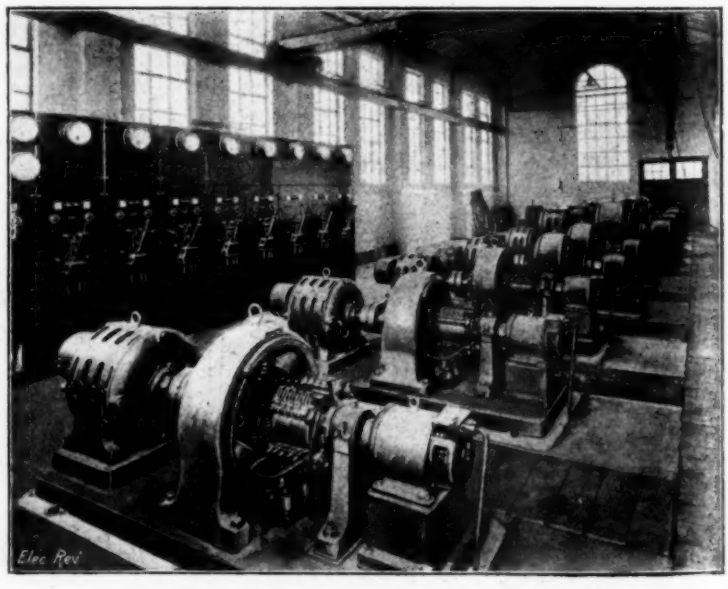


Fig. 1.—Machine Room and Power Switchboard.

The lamps are in series with two small bulbs within the station, and also a mechanical make and break device to switch the lamps off and on alternately. Should a lamp burn out, the small blubs will give occular warning.

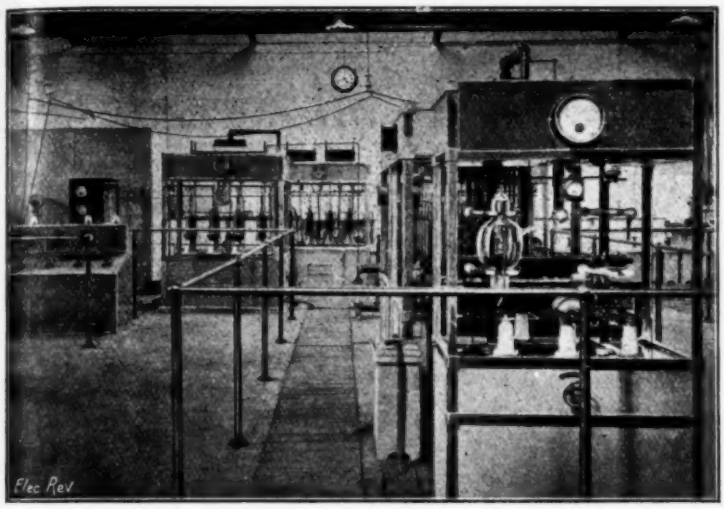


Fig. 2.—Transmitting Apparatus; Sub-modulator Panel in Foreground.

The earth system appears to be very complete, consisting in the first place of three copper sheets buried beneath the station itself, to which all machinery and frame work is earthed, and, secondly, of 36 zinc plates disposed round the station in a 100-ft. circle. Insulated wires from these earthed plates are each led on short masts over the roof of the building to the centre near the aerial down-lead, both the aerial and the connection of the 36 "earths" entering the roof near one another and proceeding directly to the tuning inductance beneath. Such an earthing system forms an electrostatic screen over the roof, and probably reduces aerial losses to some extent.

The power to operate the station is derived by duplicate cables from the Northampton Electric Light and Power Co. at 11,000 volts, the supply being 3-phase a.c., which is transformed down to 375 volts in a small sub-station. It was considered unsound to rectify the 3-phase power directly for supplying the valve transmitter, as a slight unbalance on any incoming phase might cause difficulty in maintaining the requisite degree of "smoothing," so rotary machines have been provided to furnish a single-phase supply. Besides pumps, &c., the power plant consists of three (one spare) 70-kW, 1,000-V, 300-cycle motor-alternators for supplying power to the modulator and magnifier valves; two 25-kW, 1,000-V, 300-cycle machines (one spare) for supplying power to the drive oscillator and for heating the filaments of all the rectifying valves; and three 10-kW motor-generators (one spare) delivering d.c. at from 20 to 30 volts for heating the filaments of the drive, sub-modulator, modulator, and magnifier valves. All these machines are fitted with individual self-exciters (fig. 1).

The independent drive unit comprises two air-cooled rectifying valves and one water-cooled oscillator, the former being arranged for full-wave rectification, and supply d.c. at 10,000 volts through the usual smoothing circuit to the oscillator anode. The drive oscillatory circuit is constructed of a pair of copper strip inductances astatically connected to reduce the external field, and an air dielectric condenser shielded by a metal case. The plate input to the drive oscillator is about 8 kW which is an unusually high ratio of the power supplied to the magnifier, but this permits of the magnifier grid excitation being secured with a very loose coupling, resulting in negligible reaction back on the drive and consequent freedom from frequency variation with variation of magnifier input.

The magnifier is formed of four water-cooled rectifier and three water-cooled oscillatory valves; the latter are capable of dealing with an input of 30 kW at 10,000 volts, and will be normally operated at 10,000 volts with a plate current of 2.5 amperes. The filament input is the same for all the water-cooled valves used, namely, 1 kW each at 20 volts and 50 amperes. The oscillatory circuit of the magnifier consists of an inductance of stranded cable and a shielded air condenser. The grids of the magnifier are excited inductively from the drive circuit, the direct grid-current required being about 300 milliamperes for the three valves. The grid circuit includes an anti-reaction coil inductively coupled to the plate inductance in such a manner that the internal valve capacity coupling is neutralised, so that it is not possible for the valves to operate as a self-oscillator if the drive excitation is removed. This adjustment is an important factor in securing stability of working and constancy of wavelength. The closed oscillatory circuit of the magnifier is inductively coupled to the aerial-tuning inductance, which is made of the same stranded cable as the closed-circuit coil.

The modulator portion consists of four water-cooled rectifiers and six water-cooled modulators; the modulating valves are similar in size and appearance to the oscillators, but have a much more open grid mesh with a low amplification factor. The modulator is worked

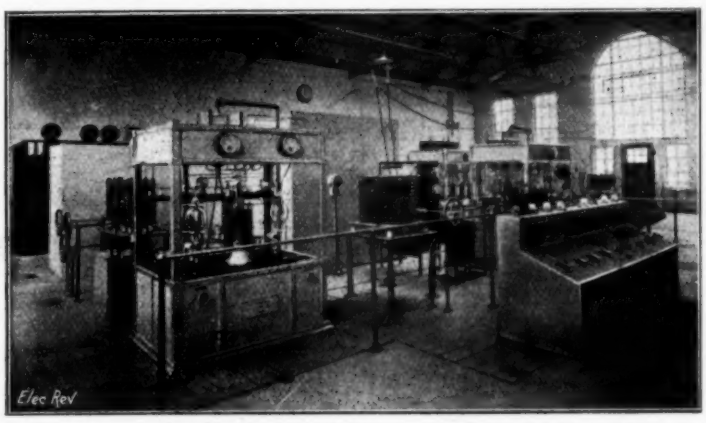


Fig. 3.—Transmitting Gear; Control Desk and Drive Panel in Foreground.

with plate voltage and current equal to that of the magnifier, the current being adjusted by the setting of the grid negative voltage; for normal working this setting is between 1,200 and 1,300 volts, negative, thus a large grid sweep is possible during modulation without running into grid current. The grid negative voltage is obtained from a dry-cell battery, and as no current is taken, this source is quite satisfactory, as has been proved by twelve months' testing at the Chelmsford station.

The smoothing circuits for a set of this size present something of a problem, as the permissible ripple is very small for high-quality broadcast telephony, and the smoothing units are necessarily somewhat bulky and costly. The condensers consist of zinc plates with glass dielectric, oil-immersed in porcelain containers; the total capacity used on each half of the circuit is approximately 3.5 microfarads, and the inductance about 16 henrys. The smoothing inductances are closed iron-core chokes in oil tanks, each choke containing about 5 cwt. of iron, and there are eight of them in all.

D

The one sub-modulator air-cooled valve is operated from the same h.p. source as the main modulator, and is coupled by resistance and capacity to the grids of the modulator valves. The grid of the sub-modulator is, in turn, coupled also by resistance and capacity to the sub-sub-modulator, which is a block of four valves supplied by a 400-volt accumulator battery and with accumulator-heated filaments. The usual land line amplifiers are situated in a separate room (fig. 4), removed as far as possible from the high-frequency apparatus, and are adaptable for amplifying either the audio-frequency currents coming over the land lines, or those from the microphone in the local studio.

Marconi-Osram valves are used, and as the anodes are at high potential, it is necessary to insulate the water jackets from the main supply of water. This is accomplished by running the water both into and out of the jackets through spraying nozzles; the water spray forms an almost perfect insulator, and no loss is sustained by leakage. The cooling water falls by gravity through the jackets, and the rate of flow is adjusted to allow about one gallon per minute through each valve. As it is important to use water free from lime or other ingredients capable of forming a deposit on the anodes, rain water is utilised; it is drained from the roof into

Fig. 4.—Mr. H. W. Litt (Engineer-in-Charge) in Amplifier Room.

a storage pond, a rainfall of one inch adding about 1,000 gallons to the pond.

London still remains the centre of the distribution system, and on reception of the signals at Daventry by land line they are amplified to the requisite strength to operate the sub-control valves, fig. 2, of the transmitter, while provision has been made for increasing the output to 50 kW should the necessity arise and permission to do so be obtained from the P.O. authorities.

A workshop and office accommodation have been provided, and the whole assemblage imparts an impression of light and spaciousness, the connections appearing to have been made with almost diagrammatic neatness. These features, together with reasonable duplication of lines and parts, should not fail to give adequate service when the new station has settled down to routine work. The transmitting apparatus has been designed and made by the Marconi Company on the "unit" system, that is to say, the apparatus for each separate operation is self-contained in polished aluminium framework, access to it being obtained through a safety gate which, when it is opened, makes it impossible to switch on the power. The control of the whole plant, including the operation of the running machinery, is effected by a control table in the transmitting room. Should any defect arise, the engineer on duty can switch off the entire plant merely by pushing one button. Prolonged experiments have been made on the land line in order to secure the best quality of transmission, and the B.B.C. has received the fullest co-operation of the Post Office engineers. The Western Electric Co., Ltd., designed the special line amplifiers; the Radio Communication Co., Ltd., was responsible for the masts and aerials, and the Electric Construction Co., Ltd., supplied the electrical machines and switchboards.

The B.B.C. is making no extravagant claims for its new station; the removal of 5 XX farther from London was a Government ruling, the authorities having stipulated that it must be situated north of a line drawn from the Severn to the Wash, and so located that as much as possible of the area served by it would be land; a 100-mile circle round the site encroaches on the sea in three places. To have worked with five different Postmasters-General and equipped 21 stations during the two years and a half the company has been in existence is no small achievement.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Adjournment.—The Prime Minister stated on August 3rd that it was hoped to adjourn to-morrow (Saturday) until November 16th.

The Mersey Tunnel.—Last week the Select Committee of the House of Lords concluded the hearing of evidence in connection with the Bill promoted by the Liverpool and Birkenhead Corporations empowering them to construct another tunnel under the Mersey between the two towns. The Committee passed the Bill.

Telephone Development.—On July 28th, Sir W. MITCHELL THOMSON, the Postmaster-General, in moving the second reading of the Telegraph (Money) Bill, said that it was proposed to authorise the State to raise credit for expenditure on the development of the telephone system at the rate during the next three years of, roughly, £1,000,000 a month. In 1925-26 it was proposed to spend £12,000,000; about £12,000,000 the year after; and £11,000,000 in the third year.

The Bill was read a second time.

Electricity in Mines.—On July 28th, during a discussion on safety in mines, a number of members urged the universal adoption of electric lamps in place of the present safety lamps. Electric lamps, it was contended, were far safer and more satisfactory. Further, the use of electric lamps would prevent miners' nystagmus.

Col. LANE-FOX, Secretary to the Mines Department, said that 350,000 of the lamps now used were electrical.

Lead Poisoning.—On July 28th, on the Home Office Vote, Lord H. CAVENDISH-BENTINCK said that lead poisoning was rapidly increasing, and electrical accumulators were responsible for a large amount of it. There were 35 cases in 1921 and 101 cases in 1924.

Sir W. JOYNSON-HICKS, Home Secretary, agreed that most cases of lead-poisoning occurred in the manufacture of electric accumulators and in the work of ship-breaking. The manufacture of electric accumulators was one of the industries which had been booming. The subject had been under the careful consideration of the Home Office, and he had issued new regulations which, he hoped, would have the effect of removing the dangers in that industry.

Radio Licences.—On July 28th, Sir A. HOLBROOK asked the Postmaster-General if he would consider the adoption of a definite scale of fees in respect of transmitting licences for wireless telegraphy so that the efforts of British research workers might be encouraged and that the valuable work of experimenters, particularly in the direction of short-wave transmission, might not be hampered.

Sir W. MITCHELL-THOMSON said that a definite scale of fees for experimental sending licences was already in operation.

Municipalities and Electrical Apparatus.—On July 30th, during the debate in the House of Lords on the Burnley Corporation Bill, Lord BANBURY moved to leave out Clause 26, which empowers the Corporation to sell electrical fittings. Up to 1902, he said, powers were given to various Corporations to supply and sell electrical fittings, but after that year, there being a strong feeling against municipal trading, no further powers were given to sell such fittings. Powers were given to supply electrical fittings on hire, because it was stated by the corporations that they were in a better position to do this than private contractors, and that it would probably encourage the use of electricity if they were allowed to let fittings on hire, but the purchase of fittings had to be made through a contractor. In 1912, the House of Lords adopted the House of Lords Model Clause, whereby any such sales or work required on consumers' premises had to be carried out through an electrical contractor. In 1919, by arrangement with the Electricity Commissioners and supply authorities, Section 23 of the Electricity (Supply) Act, 1919, was agreed to. It gave local authorities power to provide and let on hire, repair, and maintain electrical fittings, but prohibited them from selling them unless expressly authorised by their special Act or Order. But under the present Bill the Select Committee had practically turned down this clause and had given power to the Burnley Corporation to sell electrical fittings.

Last year a Select Committee deleted a similar clause in the Wakefield Corporation Bill. He objected to municipal trading.

Lord STRACHIE, as chairman of the Select Committee, explained that such power was already possessed by some 80 other authorities. The Corporation was not asking for power to manufacture, only to sell, and the Committee was unanimously of opinion that the Corporation had carried out its electricity powers very well indeed. The rates were low, and the work was done efficiently. Arrangements were made for purchase of electrical fittings on the hire-purchase system. Without some system of hire-purchase or deferred payment, small-value houses could not get electrical facilities as quickly as they should. The expansion of electricity meant cheaper light and power, and, in addition, the greater the supply of electricity the greater the demand for fittings, lamps, and so on. This, in its turn, meant that there would be an increase in employment.

Lord DONOUGHMORE, chairman of Committees, supported the clause, but pointed out that there were now in the country three systems under which the municipal authorities supplied electricity. There were some with full power to sell fittings; some with no power to sell fittings; and some with power to sell solely through contractors. All three systems could not be the best, and it was only the best that should be adopted in encouraging the expansion of the electrical industry. He urged the Government to set up an inquiry in the autumn or next year, similar to the 1912 inquiry, when there was a Joint Committee of both houses, to settle the matter once for all.

Lord SALISBURY, Lord Privy Seal, undertook to transmit this suggestion to the proper quarter.

The amendment to omit the clause was negatived, and the Bill was read a third time.

The Rutenberg Concession. — On July 30th, Captain WATERHOUSE asked the Secretary of State for the Colonies what arrangements, if any, had been made by the concessionaire under the Rutenberg concession to erect the Yarkon power house; if any pressure was being brought to bear in order to expedite this work; and if, and when, the penalty clause under Clause 4 of the agreement would come into operation.

Mr. ORMSBY-GORE said that the greater part of the area covered by the Jaffa Electric Company's concession was already supplied from a fuel power station at Tel Aviv. The company had been required to submit a scheme within a period expiring in two months' time to supply the remainder of the area, which comprised the town of Petach Tikvah and the surrounding area, either from the existing fuel station or from a hydro-electric station constructed in accordance with the original plan. The Palestine Government would no doubt consider the propriety of bringing the penalty clause into operation if the scheme was not submitted within the time limit specified above.

Royal Assent.—In the House of Lords, on July 30th, the Royal Assent to the following Bills were notified:—Statutory Gas Companies (Electricity Supply Powers); London County Council (Tramways and Improvements); and the London Electricity Supply (Nos. 1 and 2) Bills.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

A Proposed Institute of Radio Engineers.

I think it has been quite clear in all the correspondence that the above society was proposed because there did not appear to be any body in existence in this country which catered sufficiently for the growing number of wireless engineers.

I am very pleased to say that by invitation of the Committee of the Wireless Section of the Institution of Electrical Engineers, I was present at a meeting of the Committee which took place on Friday, July 25th. Matters were discussed very fully, and I must thank the Committee for the businesslike manner in which it dealt with the subject. For the present it is sufficient for me to state that I am satisfied that entrance into the I.E.E. by those professionally engaged in wireless matters is not as difficult as I had imagined, and that it is realised by the Institution that radio matters are of great and growing importance.

I would like all those who have written supporting the proposed society to feel that they have done a great deal of good in demonstrating the need of more activity in wireless matters. Further criticisms on the position after perusing any statement the Council of the I.E.E. may make in the technical Press can be sent to Mr. Y. W. P. Evans, 66, Oxford Road, Manchester. All our friends may rest assured that their interests will be well looked after.

J. Nelson.

Prescot, *July 27th*, 1925.

[A communication from the secretary of the Institution of Electrical Engineers on this subject will be found in our "Notes" columns to-day.—EDS. ELEC. REV.]

Celluloid in Accumulators.

The letter from Mr. C. Lack in your issue of July 17th may give the impression that A.F.A. cells are the only make which are fitted in glass containers, and I should therefore like to make it clear that there are numbers of British batteries which are also fitted in glass containers, and are equally efficacious in the prevention of fire.

The A.F.A. cells referred to are presumably those which are made in Germany, and in furtherance of the policy that British-made goods should be bought in preference to foreign goods, I think it well to let your readers know that there is no need to buy foreign batteries when British-made batteries of better quality than the usual Continental make can be obtained readily in every town in the United Kingdom.

D. C. McLagan,
Secretary, The Accumulator Makers' Association.

London, S.W.1, *July 28th*, 1925.

The Evolution of Electric Cookers.

The comments and suggestions given in your issue dated July 24th are very interesting. It is to be hoped that the proposals contained in the last paragraph will be adopted.

With respect to heating elements, there is now available a non-metallic element which appears to meet a long-felt want in the domestic and industrial electric heating field.

The enclosed printed matter gives some technical particulars respecting these new elements, which are sold under the trade mark "Globar." The advantages to be obtained by the use of non-metallic elements are sufficiently obvious to be fully appreciated by the *user* of the apparatus, as "Globar" elements can easily and readily be replaced by unskilled labour without the use of resistance wire or refractory supports. In other words, the client can carry out his own repairs at a minimum of expense.

As the makers of "Globar" aptly state, "Globar is to heat what tungsten is to light."

A. Imbery.

Halifax, *July 29th*, 1925.

[We are obliged to our correspondent for drawing attention to this type of heating element. No details of its composition are given in the printed matter referred to, but it is stated that the elements can be used at temperatures up to 2,500 deg. F., or even 3,000 deg. Apparently it is made in the form of rods with metallic terminals, and it is said to be mechanically strong.—EDS. ELEC. REV.]

Is there an Age Limit?

With reference to the letter by "Too Young at Forty" in your issue of July 24th, it is obvious that the writer of that letter did not serve with the forces during the war. He seems to forget the debt which he owes those that protected him, and, in fact, would now make profit out of their patriotism.

A. G. Porter,
Major.

Spalding, *July 29th*, 1925.

Your correspondent "Too Young at Forty," in your issue of July 24th, accurately "Hits the tin-tack on the cranium" without any exaggeration, and I think that perhaps my analogous "tale of woe," told briefly, may interest some of my fellow valetudinarian readers.

My late employers—a London manufacturing electrical company—were compelled to close their works last March, owing to lack of capital, trade depression, &c., and thus after 12 years' service, with excellent testimonials, I became enrolled a "Member of the Micawber Million" (or more).

I had previously been engaged for 15 years with a Lancashire firm of electrical engineers—after a five years' apprenticeship at a well-known electrical works in the North of England—and although I am "two-score-and-ten," I have never experienced one day's illness during my working career.

Since last March I have replied to dozens of advertisements in the electrical Press, &c., but without success to date, notwithstanding that I have offered to accept a mere "existing" emolument, rather than be without means or occupation any longer.

Methinks, therefore, it seems palpably obvious that I am evidently "too fossilised at fifty," with visions of a "Pauper's Palace" distinctly looming ahead.

M.I.E.E.

July 31st, 1925.

French Water Powers.—It is reported from Paris that various schemes are in course of preparation which aim at the systematic utilisation of the water powers that are still lying idle, particularly in the south. It is proposed to render it possible for the farmers all the better to be able to carry on agricultural operations and at the same time more intensively to cultivate the soil. The systematic execution of the schemes, which are said to be connected with the Dawes plan, is expected gradually to render the country to a large extent independent of the imports of coal.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The N.A.R.M.A.T. Exhibition.—An exhibition of radio apparatus produced by members of the National Association of Radio Manufacturers and Traders is to be held at the Albert Hall from September 12th to 23rd. We have received a prospectus from the publishers of the official catalogue, Messrs. A. J. Wilson & Co., Ltd., 154, Clerkenwell Road, E.C.1, containing particulars of advertising rates, &c.

Employment after Apprenticeship. — In an article upon this subject in the July issue of *Industrial Welfare*, Sir Alexander M. Kennedy analyses the causes of parents' hesitation to apprentice their sons to skilled industries, finding that the principal fear is that employment will not be available when the apprenticeship has been served. The author considers, however, that whatever the temporary difficulties are, the ultimate prospects of remunerative employment for the skilled men of the rising generation are as great as they have ever been, and that the evolution in industrial machinery and methods has made skilled apprenticeship even more indispensable to industrial prosperity. To those who are charged with any responsibility in guiding young persons entering employment to-day, the author says that in his opinion the future status and opportunities of the young skilled craftsman will be such that they need have no hesitation in recommending lads to enter themselves in the skilled crafts.

Mersey Power Co.'s Extensions.—A new extension to cost nearly £250,000 is being carried out at the Mersey Power Co.'s station at Runcorn. The following orders have been placed:—A 12,500-kW turbo-alternator, with Messrs. C. A. Parsons & Co., Ltd.; four 45,000-lb. boilers, Messrs. Babcock and Wilcox, Ltd.; and engine-room and boiler-house buildings and condensing plant, Messrs. G. & J. Weir, Ltd. The Mersey Power Co. is now giving bulk supplies of current to the Mid-Cheshire Electric Supply Co., the North Wales Power Co., and the Wirral Rural District Council. We have already reported that the Government has guaranteed the principal and interest of a loan for the purpose of these extensions under the Trade Facilities Act.

Monomarks.—Mr. W. MORRIS, managing director of British Monomarks, Ltd., writing with reference to our notice of the Monomark system (ELEC. REV., July 17th) draws attention to the fact that a trader will use the prefix B.C.M., meaning British Commercial Monomark and the subscription in such cases ranges from two guineas upwards according to the nature of the Monomark. It is the private individual's monomark which uses the prefix B.M. and is 5s. per annum.

E.D.A. Activities. — The British Electrical Development Association has published a brochure (E.D.A. 569) illustrating and describing the exhibition of electrical appliances and the special lighting displays which were arranged by the Association jointly with the E.L.M.A. Lighting Service Bureau at Brighton during this year's convention of the Incorporated Municipal Electrical Association.

Trade Announcement.—MESSRS. ALLEN-LIVERSIDGE, LTD., Victoria Station House, Westminster, S.W.1, have just taken over the sole selling agency for Great Britain and Ireland of the electric welding products of Messrs. Buckley, Saunders and Co., Ltd. (Westminster and Birmingham), including the "Pontelec" resistance welding plant, electric rivet heaters, &c.

The Baghdad Concession.—AGREEMENT APPROVED.—The amended terms of agreement submitted by Mr. Stanley, representing a London syndicate for the Baghdad Electric Lighting and Tramway Concession, have been approved by the Council of State. The concession will run for 60 years. The military plant is to be bought for approximately £50,000. Fifty per cent. of the net profits from the electric lighting branch of the undertaking and 30 per cent. of the net profits from the tramways are to go to the municipality. The charges per unit will be eight annas to the public and six annas to the Government. —*Financial Times.*

Westinghouse Interests in Japan.—Mr. E. D. Kilburn, vice-president of the new Westinghouse Electric Co. of Japan, recently stated that the objects of the company were to distribute Westinghouse products throughout Japan and to arrange for proper service to the many old, as well as the new, users of Westinghouse apparatus. Adequate stocks would be carried, repair and other service facilities would be provided, and engineering and construction assistance would be supplied to users of the company's products. The staff in Japan would be almost entirely Japanese. It was a simple matter to assemble this staff because there were scores of Japanese engineers who had been employed at the Westinghouse company's works at East Pittsburgh and elsewhere.

Social Event.—On July 18th, the employés of the Saxonia Electrical Wire Co., Ltd., Roan Works, Greenwich, S.E., went for their annual outing to Hastings. A stop was made for lunch at a hotel situated outside Hastings, and after reaching the town a tour was made through the famous St. Clement's caves. Swimming and other amusements on the front filled up the day till 4, when tea was served at the Scotch Café, the managing director, Mr. L. H. Euler, A.M.I.E.E., being in the chair.

Trade Facilities Guarantees.—An official paper issued last week states that the guarantees which have been given by the Treasury under the Trade Facilities Acts, 1921-1924, up to June 30th, 1925, amount to £54,452,936. Recent guarantees include £20,000 (guaranteed as to principal and interest) to the St. Austell and District Electric Lighting and Power Co., Ltd., for the erection and equipment of a power station and provision of mains; £1,250,000 to the Benguella Railway Co. (guaranteed as to principal and interest for 25 years) for the purchase of rolling stock and railway materials in Great Britain; and £50,000 to the Nottingham Coal Carbonization, Ltd. (guaranteed as to principal and interest for seven years) for the erection of plant to treat coal by a process of low-temperature carbonisation.

Catalogues and Lists.—SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—Price List No. 132, dealing with all makes of Association radio valves.

THE HENDON ELECTRIC LAMP CO., 104, Southampton Row, W.C.1.—A price list of "Hendon" lamps of various types.

THE LEEDS ELECTRICAL CONSTRUCTION CO., LTD., Charnwouth Street, Leeds.—An illustrated publication describing a new high-temperature electric furnace with automatic temperature control.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—Special Publication No. 7,117/3, describing a new "Cosmos" crystal set. Illustrated and priced.

SUPER-CENTRIFUGAL ENGINEERS, LTD., Imperial House, Kingsway, W.C.2.—An illustrated pamphlet advertising the "Sharples" "super-centrifugal" oil purifier.

THE D.P. BATTERY CO., LTD., Bakewell, Derbyshire.—A comprehensive catalogue (112 pp.) of the company's storage batteries for central stations, country houses, institutions, &c. Particulars are given of stands for these batteries, and the catalogue is fully illustrated and dimensioned.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The "Osram Bulletin" for July, containing articles and notes on "Osram" lamps and radio valves and their employment.

THE STEAM FITTINGS CO., LTD., West Drayton, Middlesex.—An illustrated and priced pamphlet describing a capacity multiplier for steam traps.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—A blotter, bearing a calendar for August, advertising "Elasta" electric lamps.

THE JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—A blotter advertising "Jackson" electric cookers, with a calendar for August.

MESSRS. WM. GEIPEL & CO., Vulcan Works, St. Thomas Street, S.E.1.—A pamphlet illustrating and describing the "Quead" electric cooker; and a revised price of rubber-covered wires.

Bankruptcy Proceedings.—A. O. JOYCE, 7, Parade, Leamington, Warwickshire, electrician.—The receiving order herein was made recently on a creditor's petition. The statement of affairs shows gross liabilities of £315, of which £310 is expected to rank, against net assets of £19, or a deficiency of £291. Debtor attributes his failure to lack of capital and bad trade. He states that he commenced business on his own account as a radio engineer at the above address in November last. He had practically no capital of his own at the time, and he borrowed £100 from a friend, which remains unpaid. He had got into financial difficulties, and the Sheriff had sold his trade and household effects under an execution. Debtor admits having been aware of his position since two months prior to the date of the receiving order. The first meeting of the creditors was held on July 28th at the Official Receiver's office, Coventry, when the case, being a summary one, was left in the hands of the Official Receiver as trustee.

P. L. SYMONDS, 40, Victoria Road, Great Yarmouth, electrician.—The public examination of this debtor was held on July 28th at the Town Hall, Great Yarmouth. The statement of affairs showed liabilities of £368, with a deficiency of £210. In December, 1922, the debtor commenced business as an electrician. He took another into partnership, debtor finding £100, which was used to buy stock, and the partner brought in some stock. On December 31st, 1923, the partnership was dissolved, and since 1924 debtor had traded on his own account. He bought £130 worth of radio components, expecting a purchaser, but the purchaser went to another firm, and debtor was left with them on hand. He attributed his failure to overstocking and the decline in the wireless trade. The examination was closed.

E. G. WICKS, electrical engineer, 19, Ruby Street, Bedminster, Bristol.—Trustee, Mr. F. W. Dearle, Official Receiver, 26, Baldwin Street, released June 22nd.

I. FAULKNER, 9, Derby Road, Weaste, Salford, electrical engineer, trading as the Provincial Lighting & Engineering Co.—Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester, released July 3rd, 1925.

H. RHODES, trading as the Victoria Electrical Co., Victoria Buildings, Keswick, Cumberland.—Trustee, Mr. K. J. Hough, Official Receiver, released June 28th.

A. WOOD, electrical agent, 67, Bradford Avenue, Cleethorpes, late of Great Grimsby.—Last day for the receipt of proofs for dividend, August 12th. Trustee, Mr. J. F. Wintringham, St. Mary's Chambers, Great Grimsby.

Company Liquidations.—P.S. WIRELESS MANUFACTURING CO., LTD., Ship Street, Brighton.—A meeting of creditors was held on July 27th at Brighton, when Mr. E. Webb, the liquidator in the voluntary liquidation, reported that the liabilities were £609, of which £300 was due to the trade and £309 to the bank. The claim of the bank had been guaranteed by three of the directors of the company. The net assets were £455, showing a deficiency, so far as the creditors were concerned, of £154. The company was registered on March 13th, 1924, with a nominal capital of £2,000, for the purpose of taking over the business previously carried on by Mr. H. L. Smith for the manufacture of radio instruments. The vendor was allotted 1,125 shares in the company as the consideration for the assets transferred, while 760 shares were subscribed for in cash. Preliminary accounts at December last disclosed a loss on the trading of about £200. A considerable amount of experimental work had been carried out. Up to the date of the liquidation there had been a loss on the trading of £718. The deficiency, so far as the shareholders were concerned, was accounted for by the loss on the trading, together with the depreciation written off the assets in the statement of affairs. A resolution was passed confirming the voluntary liquidation of the company, and an advisory committee was appointed, consisting of the representatives of Messrs. Hanningtons, Ltd., and Messrs. Orbell & Kirk.

The following are creditors :—

	£		£
Henderson & Co.	132	Stella Lights, Ltd.	27
Cable Accessories Co., Ltd. ...	25	Bankers	309
Ellis, W.	24		

KLYDO, LTD., 112, Belvedere Road, Waterloo, S.W.1, electric sign manufacturers.—A meeting of the creditors was held on July 27th at the above address. The liquidator of the company, Mr. E. H. Miller, presented a statement of affairs as at July 8th, which showed liabilities of £2,372, and a deficiency of £1,976. The company was formed in March, 1923, but traded without success. An agreement was entered into to fit "Klydo" signs at Wembley. The contracts were not carried out, and the directors of another company at Wembley acquired the shares of Klydo, Ltd., and endeavoured to put it on a sound financial basis, and several sums of money were advanced for that purpose. The trading was still unsuccessful, and accordingly on July 8th the creditors decided upon voluntary liquidation. The creditors decided that Mr. Miller should continue as liquidator.

The following are creditors :—

	£		£
Corbin, Greener & Cook	56	Hetley, James, & Co.	21
Gane, Jackson, Jeffries and Freeman	21	Coenigs & Hammer	62
Coleman, C.	99	Miller, Mills & Bantock	31
Crowden & Keeves	59	Rent	28

ROBB BROTHERS (GLASGOW), LTD., electrical engineers, 11, Bothwell Street, Glasgow.—At a recent meeting of creditors, Mr. A. E. R. Copeland, C.A., the liquidator of the company, presented a statement of affairs which showed liabilities of £2,723 and assets of £987, or a deficiency, so far as the creditors were concerned, of £1,736. The statement showed 7s. 2d. in the £, subject to the expenses of realisation. The company was formed in March, 1921, with a nominal capital of £3,000, of which £2,459 had been issued and was fully paid. During the year to March, 1923, there was a loss on the trading of £64, whilst in the following 12 months to March, 1925, there was a loss of £391. One of the directors of the company stated that they had been endeavouring for some time past to become members of the N.A.R.M.A.T., but had not been successful. As a result, they could not purchase on the same terms as the members of the Association, but had to pay higher prices and resell at the same prices as other merchants. That had the effect of reducing the gross profits which were earned. Last November a quantity of goods were purchased from a company and were found defective. Those goods were returned, and a credit note was given. In the interval a bill given to the suppliers had been transferred to another company who instituted legal proceedings for the recovery of the value of the bill. As a result, the company became responsible for the bill of £400, and had not received anything to replace the goods which were returned. A resolution was passed confirming the voluntary liquidation of the company, whilst a committee of three of the creditors was also appointed.

E.S. CO., LTD.—Winding up voluntarily. Liquidator, Mr. B. A. Smith, C.A., 11, Queen Victoria Street, E.C.4. A meeting of creditors is called for August 14th.

COVENTRY WIRELESS SUPPLIES, LTD.—Winding up voluntarily. Liquidator, Mr. H. M. James, I.A., 14, High Street, Coventry. A meeting of creditors was called for August 5th. Particulars of claims to be sent to the liquidator, Mr. H. M. James, 14, High Street, Coventry, by September 3rd.

ELECTROPHONE, LTD.—Winding up voluntarily.

SOUTH-EASTERN AND CHATHAM CONSTRUCTION AND POWER CO., LTD.—Winding up voluntarily. Liquidator, Mr. R. D. Heckels, 65, Coleraine Road, Blackheath, S.E.3. A meeting of creditors is called for August 14th. These notices are purely formal; all creditors have been or will be paid in full.

RADIO INSTALLATIONS, LTD.—A meeting of members is called for September 2nd, at 14, St. Mary Axe, E.C., to hear an account of the winding up from the liquidator, Mr. G. W. Askew.

BISHOP'S CASTLE ELECTRIC LIGHT & POWER CO., LTD.—Mr. G. H. Hewitt, a creditor, has presented a petition for the winding up of this company. The application will be heard at the County Court, Leominster, on August 10th.

RODERICK ELECTRIC SUPPLIES CO., LTD.—Meeting of creditors, August 10th, at 19, Eastcheap, E.C.3. Liquidator, Mr. W. H. Cork.

ENGLISH RADIO CORPORATION, LTD.—A meeting of members is called for September 1st to hear an account of the winding up from the liquidators, Messrs. C. H. Baker and A. H. Whalley, at their offices, 12, South Parade, Leeds.

Private Arrangements.—D. G. NICHOLAS, radio specialist, 14, Victoria Square, Aberdare.—The creditors interested herein were called together recently at the offices of Messrs. Clarke, Dovey & Co., Cardiff, when Mr. S. E. Clutterbuck submitted a statement of affairs which disclosed liabilities of £469. The indebtedness to the trade was £429. The assets totalled £113, leaving a deficiency of £356. It was reported that the debtor commenced business in October, 1923, without capital, his father guaranteeing the bank up to £20. The debtor had at various times borrowed from his father sums of money totalling £40, which were still outstanding. At the outset the turnover averaged about £20 to £25 a week, but it had since fallen to £10 weekly. The total weekly expenses had averaged £6 10s. The debtor attributed his present position to want of capital and depreciation in the value of stock.

The debtor's solicitor made an offer of 5s. in the £, which was not accepted, and it was decided that the debtor should be given time within which to find security for the payment of a composition of 10s. in the £ by two equal instalments at one and three months. It was also decided that the composition should be paid under a deed in favour of Mr. S. E. Clutterbuck.

The following are creditors :—

	£		£
Aberdare U.D.C.	37	Metro-Vick Supplies, Ltd. ...	25
Brown Bros., Ltd.	36	McTaggart, H., & Co.	26
Cleave, H. R., & Co.	23	North British Rubber Co. ...	21
Houghtons, Ltd.	25	South Wales Wireless Installation Co., Ltd.	27
General Electric Co., Ltd. ...	77		

H. LEAKE, trading as Harold Leake & Co., 13, Garden Street, St. Annes-on-Sea, electrician, &c.—The creditors interested herein were called together on July 24th at the offices of Messrs. J. B. Boyd, Wrigley & Co., C.A., Manchester, when a statement of affairs was presented which showed liabilities of £3,216, of which £2,044 was due to the trade. There were partly-secured cash creditors for £1,572, who held securities valued at £400, leaving £1,172 to be included with the ranking liabilities. The assets were estimated to realise £3,026, less £79 for preferential claims, leaving net assets of £2,947, or a deficiency of £269. It was stated that the debtor had been in business for a considerable period, and apparently was able to trade successfully until a year or two ago, when he felt the effects of the bad trade in the locality. A balance-sheet was prepared last January, and it showed a surplus of assets over liabilities. The turnover for the last six months was thought to have been about £1,200, but for 1924 it amounted to £6,490. Three creditors had commenced proceedings, and a deed of assignment had already been executed to protect the assets. It was decided to confirm the deed already executed, and a committee was appointed. The trustee and committee were empowered to reassign the estate for a sum sufficient to pay a dividend of not less than 10s. in the £.

Dissolutions of Partnership.—WESTERN MANUFACTURING CO., radio factors, Lydney, Glos.—Messrs. W. K. Coxon, A. S. Prosser, and E. R. Weare have dissolved partnership. Debts will be attended to by Messrs. Coxon & Weare.

NYMAN & CO., THE DIRECT WIRELESS CO., and the WIRELESS HOSPITAL, Leeds.—Messrs. S. M. Nyman and R. Scott have dissolved partnership. Debts will be attended to by Mr. Nyman, who will carry on business as Nyman & Co. and the Wireless Hospital. Mr. Scott will trade alone under the style of the Direct Wireless Co.

Hungarian Electrical Imports.—The *Board of Trade Journal* publishes a table showing the sources of imports into Hungary during 1924. Included in this is the item "electrical machinery," in which Germany is shown as the principal supplier (5,052 quintals), being followed by Austria (4,459 quintals). The United Kingdom provided only 32 quintals, Czecho-Slovakia 810 quintals, and Italy 118 quintals.

Coal Stoppage Averted.—As a result of Government intervention, the complete stoppage in the mining industry which was threatened upon the expiry of the existing agreement on July 31st was averted. The Government has undertaken to make good any losses in the industry for a period during which a Committee of Inquiry will make a thorough investigation of the position of the industry.

For Sale.—The Ayrshire Electricity Board invites offers for a complete private lighting generating plant. Owing to the installation of larger plant, the Sutton Coldfield Corporation Electricity Department invites offers for one d.c. feeder booster, complete with switchgear. Mr. H. J. Shaw will sell by auction on August 25th at 85, Newington Causeway, S.E., the stock of an electrical goods factor. (See our advertisement pages to-day.)

Book Notices.—"The Structure of Light," by Sir J. J. Thomson, O.M. Pp. xii + 38; figs. 8. London: Cambridge University Press. Price 2s. 6d. net.

"Selected Papers from the *Journal* of the Institute of Electrical Engineers of Japan."—No. 5, "Jump in the Self-Excitation of d.c. Generators." No. 6, "New Method for Electrical Machine Design."

"Quarterly Bulletin of the British Cast Iron Research Association," No. 9, July, 1925.

"Fuel Economy and Smoke Prevention," by J. B. C. Kershaw, F.I.C. Pp. xiv + 268; figs. 91. London: Constable and Co., Ltd. Price 16s. net.

Electricity Meter Approved. — The Electricity Commissioners have approved the Metropolitan-Vickers Type "N.A." single-phase watt-hour meter in rated sizes from 2.5 to 20 A, at from 100 to 600 V, frequency 50 cycles.

United States Electrical Exports.—Although the value of the United States electrical exports during May ($7,198,803) was greater than that for May, 1924, the total for the first five months of the current year was about $1¼ million less than in the equivalent period of last year. A comparison of the May exports with those of the previous May shows that generators, steam turbo-generators, and generator parts and accessories decreased by about 12 per cent., storage batteries by 17 per cent., transformers by 62 per cent., rectifiers, motor-generators and converters by about 50 per cent., electric locomotives by 72 per cent., protective devices by 71 per cent., railway motors by 50 per cent., fans by 50 per cent., electric furnaces and ovens by 86 per cent., and telegraph apparatus by over 50 per cent. On the other hand, increases occurred in the following items:—Primary batteries 35 per cent., meters 31 per cent., stationary motors, over 200 h.p., 65 per cent., flashlamps 80 per cent., motor-driven household devices 32 per cent., domestic heating and cooking appliances 40 per cent., radio apparatus 130 per cent., telephone switchboards 190 per cent., bells, &c., 70 per cent., ignition apparatus 105 per cent., lighting fittings 53 per cent., bare copper wire 190 per cent., insulated copper wire 10 per cent., and carbons 30 per cent.

Electricity v. Gas for Heating.—Messrs. Automatic and Electric Furnaces, Ltd., writing with reference to the remarks of Mr. D. Milne Watson at a recent "gas" meeting, reported in our issue of July 24th, say it is not surprising that engineering industries are not satisfied with electric power and lighting only. The economy effected in heating is best shown by the following tests, carried out by two engineering establishments, one in a "Wild-Barfield" electromagnetic furnace and the second in a gas furnace. The company gives the following figures:—

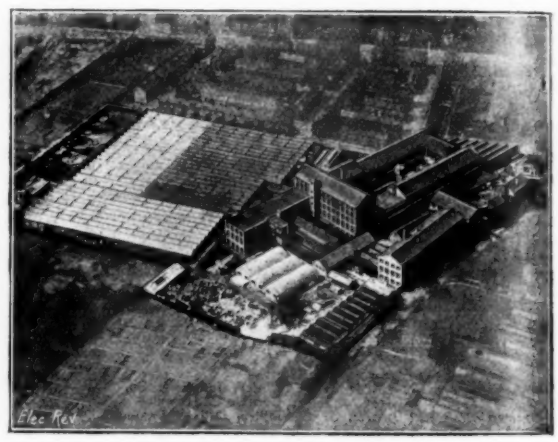
Electricity.	Gas.
Output per hour, 29.75 lb.	33 lb.
Consumption per hour, 3.41 kWh	250 cu. ft.
Price, 1d. per kWh	3s. 11d. per thousand.
Cost per lb. of steel, .1185d.	.355d.
Hardening cost per ton, 22s.	68s.

It will be seen from the foregoing that gas for hardening costs 3.08 times as much as electricity.

The German Electrical Industry.—The *Deutsche Bergwerks Zeitung* says that the rising movement in electrical shares which began early in July has directed attention to the business situation in the electrical industry. This industry is one of the few branches of German industry which are at present doing good business. Endeavours are now being made to make up for what had to be neglected during and since the war; works are completing and modernising their electrical equipment; existing power plants are being extended, and new plants built. According to a report of the Berlin Chamber of Commerce and Industry, the chief feature of the electrical industry during the past quarter has been the conflict between the urgent needs for electrical material and the lack of money and credit. Where these difficulties were not felt directly, as at electricity works and in the tramway undertakings, a large number of orders were given. In many other branches of industry extensions of plant were undertaken but generally, owing to the difficulty of procuring money, caution was observed. Business with the mining industry has been very quiet. On the whole, sales of cable, machinery and apparatus, meters and small material were satisfactory, and employment is assured for some months. There was a lively demand for measuring instruments for switchboards, heating apparatus, laboratories, and medical apparatus. Sales of telegraphic material were less satisfactory, and business declined further. Comparatively little business was done with manual telephone exchanges, but large orders were received for automatic exchanges. Sales of telephone apparatus to official and private customers were satisfactory. In the radio industry employment was good during May, but since that month the usual summer slackness has prevailed. Manufacturers of railway safety apparatus and electrical carbon products still complain of bad business. Sales of electric lamps have developed not unfavourably, but have been hindered abroad by the high Customs duties.—*Reuter's Trade Service* (Essen).

The Austrian Electrical Industry.—Until recently the electrical works of Austria were working at full capacity owing to the electrification of railways in the Tyrol and Upper Austria. As, however, these works are nearing completion, and some contemplated electrification works have been cancelled, some of the large works are suffering from a shortage of orders and have had to reduce their working hours as the only alternative to the dismissal of employés. The manufacturers entertain the hope that if the American investment credit is established the State will give them large orders for the extension of the telephone and telegraph services. The exportation of motors, dynamos, and other heavier electrical appliances is unsatisfactory owing to the competition of Germany, Czecho-Slovakia, and, lately, Poland. All these countries are able to underbid Austrian exporters, wages being much higher in Austria owing to the power of the trade unions. The most flourishing branch of the electrical industry is the radio apparatus section, which is progressing rapidly. It is noteworthy that while Austrian prices are relatively high for heavy electrical apparatus, they are low for "weak-current" appliances such as electrical toys, hand lamps, radio accessories, valves, telephones, &c. There is a huge export of the latter class to the Near East countries, Austria having very advantageous commercial treaties with these.

A Factory from the Air.—Aerial photographs have lost their novelty nowadays, but we think that the accompanying view of the Automatic Telephone Manufacturing Co.'s works at Liverpool is of interest, having regard to the importance which the company has acquired as a contractor for the provision of automatic telephones in Greater London. As viewed from the air, this extensive factory suffers from perspective, for the considerable expanse of roof ridges in the left of the picture covers one of the largest machine shops and switchboard-erecting shops in the North of England, in addition to housing certain of the assembly departments,



The Automatic Telephone Co.'s Manufacturing Works, Liverpool.

framework shop, &c. The ground area occupied is 9½ acres, the total floor area being over 270,000 sq. ft. The multi-storey buildings on the right are mainly given over to assembly, stores, packing, &c., and include an extensive suite of offices in the foreground. The large orders which are being secured for "Strowger" equipment have necessitated extensions which are now in progress. Among the orders now being executed at the works, in addition to British Post Office requirements, are "Strowger" telephones and equipment for Sydney (N.S.W.) and for the restoration of the Tokio telephone system, which was wrecked by the 1923 earthquake and fire, as well as for the Buenos Aires system. The works employ over 3,500 workpeople.

Radio Apparatus in Switzerland.—In a recent note upon the position of broadcasting in Switzerland, *Commerce Reports* states that the completion of the Basle station will give an impetus to the demand in Switzerland for radio apparatus. The local market is stocked at present with radio sets of French and German manufacture, although a limited quantity has been supplied by British firms. So far as is known, no American radio sets are at present in operation in Basle. Receiving sets now on sale in Basle retail at from 200 to 800 Swiss francs. The cheaper sets have not proved very satisfactory.

Lamp-Makers' Publicity in France.—A number of electric lamp manufacturers in France have recently joined together in a co-operative publicity scheme urging electric light users to support the French industry by only buying lamps which are really French. The announcement adds that the purchase of foreign lamps injures the credit of France.

Unemployment.—The "live" registers of the Employment Exchanges showed at July 20th a total of 1,221,900 wholly unemployed persons. This figure was 26,566 less than a week previously, but 180,116 more than in July, 1924.

German Lamp Patents in Belgium.—Before the war the Osram Gesellschaft, of Berlin, held certain Belgian patents in respect of incandescent lamps which were produced and sold by the A.E.G. This concern had a branch in Brussels which, when war broke out, was sequestrated by the Belgian Government and sold to a Ghent company. The Osram Company brought an action with respect to the patents, but lost the day in two lower courts. A final appeal was made to the Court of Cassation which, according to the *Elektrotechnische Zeitschrift*, has given a verdict in its favour, basing its decision upon the fact that patents are intellectual and not material properties, and are consequently not seizable either under the Versailles Treaty or the Belgian law.

Spanish Electrical Extension.—The Compania Sevillana de Electricidad, Seville, which is a large factor in the hydro-electric situation in south-west Andalusia, plans to spend 10,000,000 pesetas for extensions, involving the purchase of a considerable amount of electrical equipment of foreign manufacture.—*Commerce Reports.*

British Trade Mark Applications. — The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 29th :—

Cyldon. No. 458,685. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Sydney Sam Bird, manufacturing electrical engineer, Sarnesfield Road, Enfield Town, Middlesex.

Dubilier (lettering and design). No. 458,873. Class 8. Electrical condensers, resistances, and variometers. No. 458,874. Class 13. Electrical switches (ordinary). No. 458,875. Class 16. Electrical porcelain insulators. No. 458,876. Class 50. Electrical mica insulators.—The Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

Amplion. No. 459,481. Class 8. Telephonic apparatus.—Edward Alfred Graham, trading as Alfred Graham & Co., St. Andrew's Works, Crofton Park Road, London, S.E.4.

Carmalite. No. 459,448. Class 8. Apparatus for use in wireless telephony and telegraphy.—Merchants and Agencies, Ltd., 45, Basinghall Street, London, E.C.2.

Oliverna. No. 459,512. All goods in Class 8.—John Alfred Cockett, 74, Chestnut Avenue, Walthamstow, E.17.

Zigzag. No. 459,639. Class 8. Electric batteries.—W. A. Buckley & Co., Ltd., 137-138, Moorgate Station Chambers, London, E.C.2.

Kallede. No. 459,720. Class 40. Electric wires covered with india-rubber.—Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.

The Brazilian Electrical Market.—A recent *Commerce Reports* note stated that the Brazilian market for electrical goods was dull. Slowness in buying was attributed to anticipated technical improvements. Germany's competition was active on a price basis. The electrification of the Central Railway is in abeyance pending the forthcoming of the necessary funds.

A **Brazilian Railway Contract.** — It is reported that the Metropolitan-Vickers Electrical Co., Ltd., was the sole tenderer for the electrification of the branch line of the Oeste de Minas Railway, Brazil, from Barra Mansa to Augusto Pestana —a distance of 73 km. A seven-year loan has been granted to the State for this work.

Annual Holidays.—The works of MESSRS. S. H. HEYWOOD AND CO., LTD., will be closed from August 8th to 17th.

New Italian Companies. — A new electrical engineering company has lately been formed at Saronno with a capital of 30 million lire and the title La Societá per Costruzioni Elettromeccaniche "Cemsa." A number of new electrical engineering and electricity supply companies were also formed during last month.

New Belgian Companies.—Among the recently-constituted Belgian companies are the following :—Gaz et Électricité de Herstal (Brussels), capital four million fr., to produce and distribute electricity and gas for all purposes; and l'Electricité de la Lesse (Anseremme), capital 300,000 fr.

Manufacturing in Argentina. — The *Review of the River Plate* says that in embarking upon manufacturing, Argentina has been able to take advantage of the accumulated experience of other countries. The Argentine manufacturing industries are for the greater part working with up-to-date machinery for the simple reason that it is only within the last six years or so that the industries employing this machinery have come into being. There are few manufacturing or power-producing plants built ten years ago which could remain efficient without complete renovation in the light of the progress which has been made since their inauguration. A committee appointed by the Department of Navigation and Ports has reached the conclusion that certain falls in the province of Corrientes could, with an outlay of a little over $100,000,000 on plant and installation, be made to yield electrical energy of which the provinces of Corrientes, Entre Rios, and Santa Fé, as well as the Federal capital, could draw almost unlimited supplies. Our contemporary points out, however, that there are other more easily realised and more urgent schemes to be attended to first.

Threatened Tramway Strike.—The introduction of motor-omnibuses by the Stalybridge Joint Tramways and Electricity Board has caused a disaffection amongst its tramway employés. Their principal grievance is that tramwaymen are being replaced and that the wages paid to omnibus drivers are lower than those paid to tramcar drivers. It was reported that seven days' notice had been given, to expire on Wednesday midnight (August 5th), of the men's intention to cease work unless certain conditions were agreed to by the Board.

Lighting and Power Notes.

Algeria.—HYDRO-ELECTRIC DEVELOPMENT.—A Government inquiry was recently held in connection with a project to utilise the water power of the Upper Cheliff river between Boghari and Lavigerie for electrical purposes. It is proposed to build several dams to form storage reservoirs, the first of which would be near the Gribbs Gorge above Dolfusville (Amoural). The dam would be nearly 200 ft. high and would form a reservoir of a capacity of approximately 50,000,000,000 gal.

Australia.—MELBOURNE.—*Year's Working.*—We have received from Mr. W. H. Alabaster, city electrical engineer, a copy of his report together with the statement of accounts on the working of the electricity undertaking for the year ended December 31st last. The revenue account records a total income of £458,307, as compared with £437,905, and working expenses of £281,626, as against £276,407. The gross profit was thus greater by £15,184 at £176,682. After providing for capital charges, there was a net surplus of £64,656, as compared with £61,997, of which £25,000 was allotted to the city fund. During the year £147,950 was spent on capital account, the chief items being £75,615 for mains, £22,086 for machinery, and £14,603 for sub-stations, transformers, &c. The sales of electrical energy increased by 914,792 kWh to 65,491,808 kWh, and the maximum supply demanded from 25,700 to 28,100 kW. The load factor showed an improvement of 7.03 per cent., at 31.99 per cent. During the year arrangements were completed for the taking over by the Council of the Melbourne Hydraulic Power Co.'s undertaking.

GREATER BRISBANE.—The Town Council has received a report from the Electric Light, Power and Transit Committee with regard to the erection of a super-power station to meet the needs of Greater Brisbane, in which it is recommended that before proceeding with the scheme, preliminary negotiations be entered into with the City Electric Light Co., Ltd., for the acquisition by the Council of the undertaking, the Committee being of opinion that the electricity company's supply in the area should be controlled by the Council. The recommendation has been adopted, and a proposal to borrow £10,000 for the completion of the Ithaca lighting scheme has also been approved.

Bethesda.—PROPOSED SCHEME HELD UP.—Some time ago the Urban Council decided to provide electric light for the district, a scheme being approved which would cost about £8,000. Opposition arose, and an inquiry was proposed. The Gwynedd Trust offered to work on its own account, but owing to considerable delay in the holding of the inquiry the Trust withdrew its offer. As a result the Electricity Commissioners have announced that they will not hold an inquiry, and the project is in abeyance.

Birkenhead.—TEMPORARY SUPPLY.—The Electricity Committee has considered the question of obtaining a temporary supply of current to cope with the load during the forthcoming winter. The electrical engineer has reported that Messrs. Cammell Laird & Co. have agreed to give such a supply by arrangement for an interchange of current, and the Committee has agreed to an interchange of current whereby an additional supply of 1,000 kW will be available to the Corporation for the forthcoming winter at the price charged by the Corporation for any current supplied to the company. The engineer has been authorised to provide the necessary transformer, main connections, and switchgear at an estimated cost of £850.

LOAN.—Sanction has been obtained to a loan of £39,682 for electricity purposes.

ELECTRICITY AGREEMENT.—The Electricity Committee has received from the Town Clerk of Liverpool, an intimation that his Committee is unable to recommend the City Council to accept the amendments of the Birkenhead Council in the terms and conditions of the proposed agreement for the supply to Birkenhead of electricity in bulk.

Brighton.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. John Christie) for the year ended March 31st last, show a total income of £201,095, as compared with £185,017 in the preceding year. Working expenses totalled £134,939, as against £130,551, leaving a gross profit of £66,156 (£54,466). After deducting capital charges there was a net surplus of £23,646, to which was added a balance from the previous year of £13,492, making a total of £37,138. Of this amount, the surplus from the preceding year was contributed to the borough fund, and the remainder carried forward. During the year £53,721 was spent on capital account, the chief items being £12,992 for machinery and plant, and £24,633 for mains. The sales of electrical energy increased from 15,666,907 to 18,122,667 kWh, and the average price per kWh obtained fell from 2.57d. to 2.42d. The maximum supply demanded rose from 10,200 to 11,400 kW.

Cambridge.—PURCHASE OF UNDERTAKING.—The Town Council in May last decided to take steps to acquire the local electricity undertaking owned by the Cambridge Electric Supply Company, but the company states that it is advised that the right of purchase given to a local authority cannot be exercised without the consent of the Electricity Commissioners, which the Council has not received. In the circumstances the Electric Supply Committee has recommended that no further steps be taken in the matter at present.

Chile.—Electrical Development.—The Compania Chilena de Electricidad is now operating two hydro-electric and one steam-operated power stations with a total capacity of 60,000 kW. By means of 110,000-, 44,000-, and 12,000-V h.p. lines, and 220-, 380-, and 440-V l.p. mains, the company is supplying electricity to over 30,000 consumers in the Santiago district and in the Aconcagua Valley.

Clitheroe.—Electricity Scheme.—At a recent meeting of the Town Council, Councillor J. Bootham submitted the estimate of Mr. Hawtayne, consulting engineer to the Corporation in connection with the proposed supply of electricity to the borough. This covered three years, the estimated capital expenditure during the first year was £17,880, second year £7,720, and third year £7,000, a total of £32,000. It was decided to apply for sanction to borrow the last amount.

Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation an Order made by them for the supply of electricity by the Town Council within the borough and part of the rural district.

Continental.—Italy.—A 12,000-kVA three-phase alternator built by the Società Ansaldo, of Cornigliano Ligure, has recently been installed at the Rovesca power station of the Società Generale Edison di Elettricita, in Milan.

France.—In order to meet the increasing demand two new boilers and additional 45,000/10,000-V transformers are being installed at the Comines generating station of the Société de l'Energie Electrique du Nord de la France. When the work in hand is completed the plant will have a total capacity of 60,000 kW.

Spain.—La Sociedad Electrica del Viesgo has applied to the Spanish Government for authority to establish a 95,000-V transmission line between its hydro-electric stations at Urdon and Camarmena.

A large hydro-electric plant for the municipality of Murcia is shortly to be erected by the Seville Electric Co., which controls all hydro-electric facilities in South-West Andalusia. The estimated expenditure is 10,000,000 pesetas; a large amount of foreign equipment will be purchased.—*Reuter's Trade Service* (Bilbao).

Germany.—It is reported that the Siemens-Schuckert Co., of Berlin, has contracted to construct and finance a big electricity distribution system extending over the whole of the Gross-Strehlitz district of Upper Silesia.

According to a report recently issued by the Berlin Stadtische Elektrizitatswerke, the output of the electricity stations last year amounted to 462 million kWh, an increase of 26 millions over 1923. In order to provide for the rapidly increasing demand, plans have been prepared for the establishment of a large new power station at Rummelsburg, to finance which it is reported, efforts are being made to raise a loan in the United States.

Edinburgh.—Price Reductions.—The Corporation Electricity Committee has recommended the following reductions in the charges for electricity:—Ordinary power rates: For the first 1,000 kWh, from 2d. per kWh to 1.5d., while as against the old charge of 1d. for the next 39,000 kWh, it is proposed to substitute a rate of .85d. for the next 30,000, and the charge of .75d. per kWh under the old scale to consumers of over 40,000 kWh, is to be extended to users of over 31,000 kWh. The Committee has approved of a proposed special power rate for the lighting of shop windows after closing hours.

Erith.—Electricity Supply.—The new agreement with the Woolwich Town Council for a bulk supply of electricity having been finally settled, the Urban District Council has received sanction to a loan of £13,910 for the duplicate main transmission line.

Herne Bay.—Inquiry.—Col. T. C. Ekin held an inquiry on July 28th into the application of Messrs. Hunt & Sons for an Order to supply electricity in the urban district and in the parishes of Herne and Reculver, and into an application by Major B. Prescott-Westcar, of Strode Park, for a Special Order to supply electricity in the parish of Herne south of the Southern Railway. For Messrs. Hunt & Sons, Mr. Jacques Abady said that the area scheduled by Major Prescott-Westcar was subsequent to that of Hunt & Sons. The dispute was therefore as to whether Hunt & Sons' area should be cut short by the railway line or should include Herne and Reculver south of the railway as originally scheduled. It was intended to take a bulk supply of electricity from the Canterbury City Council. After a conference it was announced that the dispute had been settled on terms. The result was that the application of Major Prescott-Westcar was withdrawn, as also was the opposition to the application of Messrs. Hunt and Sons.

Ilkley.—Street Lighting.—The street lighting in the town is being converted from gas to electricity.

India.—Hydro-Electric Development.—On July 21st, according to the *Daily Mail*, Lord Goschen, Governor of Madras, turned the first sod of the great Metur dam and irrigation scheme designed to provide irrigation for 400,000 acres, and costing more than £2,000,000. The project consists of a masonry dam 200 feet high and 6,352 feet long on the Cauvery, and an 80-mile main canal and distributors. Important hydro-electric development proposals in connection with the dam are under consideration.

Jersey.—Power Station Inaugurated.—The first power station to be constructed in Jersey was formally inaugurated at Albert Pier on July 27th by the President of the Piers and Harbour Committee.

Kent.—Electricity Order.—The London Electric Supply Corporation, Ltd., is to apply to the Electricity Commissioners for an Order to supply electricity in bulk to the West Kent Electric Co., Ltd., and the Kent Electric Power Co., Ltd.

Lancaster.—Electricity Schemes.—The Town Council is applying to the Unemployment Grants Committee for assistance in respect of a scheme for the extension of the h.p. feeder cable from Bralk to Bowerham sub-station, and for the purchase of two transformers and the alteration and extension of the switchgear at the sub-stations at a cost of £6,000; also for laying l.p. mains in various parts of the borough at a cost of £4,000. Sanction to borrow £10,000 will be applied for.

Leeds.—Electricity Agreement.—The Electricity Committee has agreed to terms with the Yorkshire Electric Power Co. for an interchange of electricity supply at Farsley.

London.—St. Pancras.—The Electricity Committee is applying for sanction to loans of £21,340 for mains, £3,500 for meters, and £1,500 for domestic apparatus.

Sanction has been received to the borrowing of £11,700 for mains and £17,135 for converters and switchgear.

The report on the working of the electricity undertaking (engineer: Mr. S. W. Baynes) for the year ended March 31st last shows an income of £214,391, against £213,299 for the year 1923-4. The working costs amounted to £120,560, against £111,204, leaving a gross profit of £93,830 (£102,094). The net result of the year's working is a profit of £18,157, against £31,500 for the preceding year. The capital expenditure during the year amounted to £114,959 paid out of loan, plus £658 paid out of revenue, bringing the total capital expenditure up to £1,062,224. The energy sales amounted to 21,047,231 kWh, compared with 19,548,215 for the previous year. The maximum demand was 13,493 kW, an increase of 1,999 kW, and the average price per kWh during the year was 2.35d.

Southwark.—The Committee of Local Authorities Owning Electricity Undertakings has decided that it will be more economical for the Southwark Borough Council to extend its generating station than to take bulk supplies from authorities or companies, and representations are being made to the Electricity Commissioners accordingly.

Hammersmith.—A fire which occurred at the switchboard of the Borough Council's electricity works disorganised the electricity supply of the district for two hours on July 31st, light and power being cut off until the defect was remedied. Four of the works employés were overcome by fumes and were treated at West London Hospital, but soon recovered.—*Times.*

Morecambe.—Electricity Supply.—The borough electrical engineer has reported that generation of electricity at the old Woodhill Lane station of the Corporation has now entirely ceased and all the energy used by the town is supplied under the joint scheme from the Lancaster generating station. A sub-committee has been appointed to offer the Woodhill Lane plant for sale.

Offices and Showroom.—The Electricity Committee has appointed a sub-committee to arrange for the provision of central offices and showroom for the Corporation's electricity distribution undertaking.

Ramsbury.—Electricity Scheme.—The local Council has appointed a committee to consider a scheme for public lighting by electricity submitted by a Mr. Smith, who has stated that he is prepared to put down plant providing for 1,000 lamps.

Seaham Harbour.—Electricity Supply.—The Urban District Council has under consideration a scheme for a supply of electricity to the town.

South-East Lancs. Electricity Board.—Schemes Recommended.—Proposals by the Oldham Corporation for the erection of a new power station at Chadderton were considered at the last meeting of the Engineering, Advisory and Finance Committees of the South-East Lancashire Electricity Board, which decided to recommend the Electricity Commissioners to sanction the erection of the station. The following plant and mains extensions received approval:—Manchester Corporation, six 33,000-V cables (two of them to be laid only if financial assistance is granted by the Government); Stockport Corporation (two 10,000-kW turbo-alternators, to be installed in two sections); and other applications from the Bury and Buxton Corporations, and the Lancashire Electric Power Co. (Radcliffe station).

Willesden.—Loan Sanctioned.—The Urban District Council has obtained sanction to borrow £2,698 for the erection of a transformer station at Churchill Road.

Wimbledon.—Loan Sanctioned.—The Electricity Committee has obtained sanction to borrow £47,000 for mains and services, and £8,500 for transformers and sub-station equipment.

New Plant.—The Committee has recommended the installation of plant of 3,000-kW capacity, and is seeking sanction to a loan of £20,000 for the purpose.

Sub-Stations.—Sites are to be secured on the Merton Park estate for the erection of transformer sub-stations.

York.—Electricity Charges.—The Electricity Committee has recommended to the City Council that the charge for a supply of electricity to an electrically-fitted four bedroomed house be 10d. per week, plus a "unit" charge of ¾d.

Tramway and Railway Notes.

Continental.—SPAIN.—Application has recently been made to the Spanish Government for a concession in respect of a projected electric railway between Renteria, Lezo and Pasages de San Juan. A line is also to be constructed between Lezez and Ferreira, province of Pontevedra.

GERMANY.—A company has recently been formed, and is receiving the support of the provincial authorities concerned, for the purpose of constructing a high-speed electric railway between Cologne and Dortmund. The estimated cost of the line is approximately 15 millions sterling.

Doncaster.—TRANSPORT CONFERENCE.—A private conference was held at the Doncaster Mansion House, last week, as to whether the tramway track to Bentley should be relaid or the system replaced by a railless-car service or motor 'buses. The conference was attended by a representative of the Ministry of Transport, members of the West Riding County Council, the Doncaster Corporation, and the Bentley Urban District Council.

Dover.—RAILLESS CARS.—The Tramways Committee has recommended to the Town Council that application be made for powers to run railless cars in the borough.

Dudley.—TRAMWAY ROUTE TO CLOSE.—It is reported that the tramway between Dudley and Wordsley is to be abandoned and a motor-omnibus service substituted.

London.—ACCIDENT.—A number of passengers were injured in a tramcar smash which occurred on July 31st at Dog Kennel Hill, East Dulwich. One of the tramcars had nearly reached the top of the hill, when it started to run backwards. The brakes were applied, but failed to act, and the car ran into a stationary car at the bottom of the hill. Of the injured, only the driver of the stationary car was detained at King's College Hospital.

LONDON ELECTRIC RAILWAY ORDER, 1925.—The Minister of Transport has approved and proposes to issue an Order authorising the London Electric Railway Co. to acquire land at King's Cross for the construction of railways and works described in the Order.

Leeds.—FARES.—The tramway manager (Mr. W. Chamberlain) has recommended to the Committee that the tramway fares be reduced as follows:—Maximum fare to 3d.; 3d. fares to 2½d.; 2½d. to 2d.; the penny fares to remain as at present.

Salford.—THROUGH RUNNING.—The Tramways Committee has recommended the Town Council to support a proposal for the through-running of tramcars from the borough to Middleton *via* Rhodes. Negotiations are proceeding with Manchester Corporation in this connection.

Telegraph and Telephone Notes.

"Beam" Radio Station.—PROGRESS.—The Marconi Co. expects to complete the Post Office "beam" wireless station at North Petherton, near Bridgwater, on a site of about 300 acres, by the end of September, says *The Times*. It will consist of two sections, one of which will be used for receiving communications from Canada and the other from South Africa. Each aerial system will be supported by five steel lattice masts, 200 ft. high, 12 ft. square at the base, and 139 ft. apart. Fifteen feet from the top of each will be a cross-arm support, from which will hang the aerial and reflector wires. The transmitting station for the system is in course of erection at Bodmin.

Brazil.—NEW RADIO STATION.—The American, English, French, and German Consortium has obtained the approval of Brazilian authorities to construct a large radio-telegraph station at Pernambuco, says *T. & T. Age*. The Minister of Marine has approved the project, and construction will commence as soon as arrangements can be made with contractors. The station is to have seven towers, each 150 metres high, and will be used primarily as a receiving relay station between the United States and Europe, on the one hand, and Rio de Janeiro and Buenos Aires, on the other, and is regarded as necessary to maintain uninterrupted service, because of poor receiving conditions at Rio. The station will be equipped to communicate directly with both the United States and Europe, and it will take from 18 months to two years to finish.

Czecho-Slovakia.—RAILWAY TELEPHONY.—From Prague it is reported that negotiations are in hand for the installation of the Hith telephone system on one of the express trains of the Czecho-Slovakian State railways in order to enable passengers to make telephone calls while travelling.

France.—TELEGRAPH CONGRESS.—An International Telegraph Congress is to be opened in Paris on September 1st; among the matters to be dealt with is the revision of the international telegraph agreement.

Germany.—LONG-DISTANCE TELEPHONY.—A direct long-distance telephone line has been established between Posen and Berlin, *via* Frankfurt on Oder, and an effort is also being made to establish direct communication with Breslau.

Italy.—RADIO-TELEGRAPHY.—The Compania Italo Radio, which is now exploiting the Italian radio-telegraph system, has recently established regular communication between Italy and the United States.

Pacific Cable.—DUPLICATION SURVEY.—It is reported that the cable steamer *Isis* was to leave New Zealand early this month on a surveying expedition in connection with the duplication of the Pacific telegraph cable from Fiji to Vancouver.

The Telephone Service.—KIOSK EAVESDROPPERS.—A device to prevent eavesdropping outside telephone call-boxes is being tried at Fleetwood Post Office. Fleetwood uses the trunk lines more than any other Lancashire town, as most of the business of its fishing industry is transacted over the telephone, and complaints have been received that people outside the telephone call-boxes overheard conversations, thereby obtaining important business information. The Post Office, therefore, has installed a "buzzer," which comes into operation as soon as the caller closes the door. It cannot be heard inside the box, but prevents those outside from overhearing the conversation.

PHONOGRAMS.—The postal authorities in Leeds have inaugurated the acceptance of telegrams through ordinary slot-meter telephone call boxes, the user paying the telephone call and telegram fees into the box in pennies. Liverpool followed suit on August 1st, and the scheme, which is being tried in Manchester, will be extended if successful.

Radio Notes.

Czecho-Slovakia.—NEW STATIONS.—An American firm has obtained a contract from the Ministry of Posts and Telegraphs, says *Commerce Reports*, for constructing a broadcasting station in Prague, to be completed within six months at a cost of 3,000,000 Czech crowns. The new station will be used for broadcasting over the entire Republic; its power will be five kW and the wave-length 500 metres, which it will be possible to increase to 2,000 metres. It is also planned to erect stations, each of 1 kW, in Brno, Bratislava, and Kosice; they will broadcast on a 500-metre wave-length.

Germany.—NEW STATION.—The new Elberfeld broadcasting station has been completed, and tests on a wavelength of 207 metres have been very successful. The station will begin regular programmes probably this week, says *The Times*.

Japan.—NEW STATIONS.—Mr. Y. Niwa, chief engineer of the Nippon Electric Co., which is affiliated with the International Western Electric Co., is in New York studying radio matters, and announces that early next autumn Tokio and Osaka will each have a broadcasting station; the former city has hitherto been served by a temporary station.

Radio Leagues.—RIVAL BODIES.—The "Wireless League," which was formed last March by the efforts of the *Daily Express* and claims to have 81,000 members, but has apparently not yet been legally registered, now has a rival. It is reported that certain "founder" members, claiming that the committee was not appointed in accordance with the proposed constitution of the League, have expressed their dissatisfaction by incorporating the "New Wireless League."

Shanghai.—RADIO EXHIBITION.—What was said to be the first radio exhibition held in China, took place on May 9th and 10th. It was promoted by the International Amateur Radio Association of China and was well attended, says *Commerce Reports*, and the exhibits included all types of receiving sets from crystal to superheterodyne; transmitting sets were also shown, as well as some short-wave receiving equipment. Although the importation of radio sets into China has been officially reported as falling within the arms embargo, radio sets have filtered into the market from various unknown sources. One station in Shanghai broadcasts daily on a wavelength of 356 metres.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—State Electricity Commission. September 21st. 250-kVA, 22,000-V transformers and spares. September 15th. Postmaster-General's Department. (Sched. C.36). Telegraph equipment. Tender forms from High Commissioner, London.

NEW SOUTH WALES.—New South Wales Railways. October 7th. One 20,000-kW turbo-alternator for White Bay power house.

NEWCASTLE.—September 22nd. Caledonian Collieries, Ltd. Ward-Leonard electric winding engine for Aberdare central colliery, complete with balancer, exciter, and the necessary switchgear.

Dundee.—August 19th. Town Council. Electric lighting for Lawton housing scheme (200 houses) and Stirling Park scheme (20 houses).

Egypt.—CAIRO.—September 9th. Ministry of Education. One 50-h.p. Diesel engine, generator, electric motors and machine tools for the Mansurah Trades School.*

Fleetwood.—August 24th. Urban District Council. Feeder cable and pillar. (See this issue.)

Glasgow.—August 11th. Corporation. Electric light installation for Elder Park Child Welfare Clinic, Govan.

Ilford.—August 18th. Urban District Council. 660-V paper-insulated cable.

India.—India Store Department.—August 11th. 313-kVA, 3-phase alternators and exciters and accumulator cells. (July 24th.)

Kettering.—August 28th. Electricity Works. One cooling tower and tank circulating water pipe. (July 31st.)

London.—August 26th. Metropolitan Asylums Board.—Installation of additional electric lighting at North-Eastern Fever Hospital, Tottenham. (July 31st.)

Acton.—August 28th. Borough Council. Overhead wiring at the Council's Isolation Hospital, Wales Farm Road, Acton. (See this issue.)

Lowestoft.—August 14th. Metropolitan Asylums Board. Overhauling and refitting two electric generating sets (Willans and Robinson) at St. Luke's Hospital, Lowestoft. (See this issue.)

Manchester.—August 12th. Education Committee. Electric lighting installation at Harpurhey High School.

August 18th. Electricity Department. One water-tube boiler, &c. (July 24th.)

August 20th. Electricity Department. Supply and erection of constructional steelwork at Burnage sub-station.

August 11th. Tramways Committee. Supply and delivery of steel girder tramway rails, steel fishplates, steel clip plates, and coach screws. Specifications and forms of tender from Mr. H. Mattinson, general manager, 55, Piccadilly, Manchester.

Newbury.—August 10th. Board of Guardians. Electrical generating plant at the Poor Law Institution. (July 31st.)

Newport (Mon.).—August 15th. Electricity Department. Ferro-concrete foundations for a 10,000-kW turbo-alternator and condensing plant, and one 49/50-ton engine-room crane, &c. (July 24th.)

New Zealand.—Wellington.—September 22nd. Post and Telegraph Department. Bituminous tape.*

September 29th. Public Works Department. 560 galvanised steel transmission line towers, complete with cross-arms, ground stubs, and accessories. (A.X. 2.250.)*

Preesal.—August 17th. Urban District Council. 6,600-V cables, l.p. distribution and service cables, including excavation and reinstatement. (July 24th.)

Salford.—August 12th. Board of Guardians. Electric lighting installation at Old People's Homes, Pendleton. (See this issue.)

South Africa. — Johannesburg.—September 3rd. South African Railways and Harbours. Five 4-wheeled traversers and two tractors.*

October 13th. Electricity Supply Commission of South Africa. Equipment and buildings for an electric power station at Durban:—Complete boiler-house equipment, also other plant and piping; boiler-house installation, including pulverised fuel equipment, with buildings, piping and other plant; steel-frame buildings; overhead electric travelling crane; coal- and ash-handling plant; two 12,000-kW turbo-alternators; condensing plant and auxiliary apparatus; transformers for power station; and switchgear and auxiliary plant. (July 31st.)

Bulawayo.—September 29th. Municipal Council. Plant for the extension of the electricity works.*

Stockport.—September 5th. Board of Guardians. Conversion of lift at Stepping Hill Hospital from hydraulic to electric power. Particulars from the Steward at the hospital.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—Victorian Railways. Accepted:—
15-ton electric travelling Goliath crane (£2,005).—Babcock & Wilcox, Ltd.—*Tenders.*

Brighton.—Lighting Committee. Accepted:—
Coal-handling plant at Southwick (£10,530).—Strachan & Henshaw, Ltd.
E.h.p. switchgear and panel (£1,346).—A. Reyrolle & Co., Ltd.
75-h.p., 3-phase motor (£150).—Fuller Electrical & Manufacturing Co.
Two 1,000-kW La Cour converters (£4,114 each).—Bruce Peebles & Co., Ltd.
9-way neutral feeder panel (£226).—Metropolitan-Vickers Electrical Co., Ltd.

Tramways Committee. Accepted:—
100 tons steel-girder track rails (£9 per ton).—Anglo-Belgian Improvements Corporation, Brussels.

Carlisle.—Electricity Committee. Accepted:—
Erection of new electricity works, Willow Holme (£18,238).—Messrs. Durham & Veevers.

Erith.—Urban District Council. Accepted:—
Wiring 14 bungalows at Bedonwell (£63).—Erith Electrical Co., Ltd.

Glasgow.—Electricity Committee. Accepted:—
Erection of sub-station at Bishop's Road (£879).—James Crawford.
Erection of sub-station at Fleurs Avenue (£848).—R. Murdock & Son.

Housing Committee. Accepted:—
Electric lighting installation at Langlands housing scheme (£795).—Robert Mickel.

Halifax.—Tramways and Electricity Committee. Recommended:—
Supply and erection of e.h.p. switchgear at Highroad Well depôt (£8,447 8s.).—British Thomson-Houston Co., Ltd.

Accepted:—
Foundations for four additional cooling towers.—P. Fulcher, New Road (£5,760); J. Berry, New Bank (steelwork).

Hastings.—Electricity Committee. Recommended:—
Selective panel to switchboard (£99).—Messrs. W. T. Glover & Co., Ltd.

Hebden Bridge.—U.D.C. Accepted:—
Installation of electric lighting in houses at Eaves Bottom.—Bell Electrical Co. (Northern), Ltd.

London.—Stepney.—Electricity Supply Committee. Recommended:—
Feeder and sub-feeder boxes (£424).—British Insulated & Helsby Cables, Ltd.

Fulham.—Board of Guardians. Accepted:—
Renewal of 100 cells in the storage battery at the Union.—Hart Accumulator Co., Ltd.

Westminster. — General Purposes Committee. Recommended:—
Modernising electricity installation at Caxton Hall (£205 10s.).—Belshaw and Co., Ltd.

Sowerby Bridge.—West Riding County Council. Accepted:—
Installation of electric light at police station.—Mr. J. Quain.

York.—Education Committee. Accepted:—
Installation of electric lighting at Castlegate School (£276).—H. Mandefield.

Electricity Committee. Recommended:—
Erection of sub-station at Wringhouses (£144).—R. Turner & Son.
Boiler foundations at Foss Islands station (£222).—W. Birch & Sons, Ltd.

Notes.

A New Electrically-equipped Dock. — A new dry dock, 515 ft. long, has been built at Sunderland for Messrs. T. W. Greenwell & Co., Ltd. The machinery throughout is electrically driven from the Sunderland Corporation supply. The bulk of the installation has been provided by the Sunderland Forge & Engineering Co., Ltd. The sub-station containing the high-pressure switchgear, &c., also accommodates an air-compressing plant, with a maximum capacity of 1,650 cu. ft. per min. at 100 lb. pressure. A d.c. 100-V motor-generator set is installed in the pump-house supplying lighting for the dock and ships in dock, and also a portable electric-welding plant. A new electric travelling crane, built by Messrs. Samuel Butler and Co., Ltd., has been installed on the north-west side of the dock, and embodies the most modern ideas; it is capable of lifting a load of 50 tons at a 40-ft. radius, or 25 tons at the centre of the dock, the maximum radius being 120 ft.

N.A.S.E. Scholarship Scheme. — The third annual competition in connection with the W. E. Highfield scholarships closes on Monday next, August 10th, at 12 noon, by which time all papers submitted by candidates must be in the hands of the secretary at 43, Russell Square, London, W.C.1.

London Electrical Engineers.—27th A.A. Battalion R.E. (T.A.). Honorary Colonel, Colonel R. E. B. Crompton, C.B.; Officer Commanding, Lieut.-Col. C. H. S. Evans, O.B.E., A.M.I.E.E. The following orders have been issued for August:—

304th Company (Major W. H. Merrett, T.D., A.M.I.E.E.).—Mondays, 7 p.m. to 9.30 p.m. Overhaul and packing of plant for annual camp. The Company proceeds to annual camp on Sunday, August 16th, and will man five detached lights.

305th Company (Major A. W. M. Mawby, O.B.E., A.M.I.E.E.).—Tuesdays, 7 p.m. till 9.30 p.m. The Company proceeds to annual camp on Sunday, August 30th, and will man five detached lights.

306th Company (Major F. C. Clarke, A.M.I.E.E.).—Fridays, 7 p.m. to 9.30 p.m. The Company proceeds to annual camp on Sunday, August 30th, and will man five detached lights.

Final musketry practice at Rainham Ranges at 12.30 p.m., August 9th. All vehicles and plant will be entrained on August 13th. Twelve searchlights at the British Empire Exhibition will be manned by 305th Company and 306th Company from August 16th to August 30th, and by 304th Company from August 30th to September 13th.

The annual camp will be held from August 16th to September 13th at Watchet (near Minehead, Somerset). Headquarters at 46, Regency Street, S.W.1, will continue to be open till 8 p.m. on weekdays, and 1 p.m. on Saturdays.

The Officers' Mess during camp will be at A.A. Camp, Doniford, Watchet, Somerset.

Belt and Rope Driving.—Errata to article, p. 169, July 31st, 1925:—

In (2) $T/t = e\mu\phi$ should be $T/t = e^{\mu\phi}$; 2nd column, 3rd line below illustration, $2R = 2.926\ (2 - \phi)$ should be $2R = 2.926\ (T - t)$.

In (14) P = total $42{,}700\ n \times$ horse power/v should be $P_{total} = 42{,}700\ n \times$ horse power/v.

In (18) the denominator $R \times n$ should be $R \times N$.

Electricity Commissioners' Advisory Committee on Domestic Supplies.—We have been informed that the constitution of the Advisory Committee on Domestic Supplies and Methods of Charging appointed by the Electricity Commissioners, which we announced in our issue of April 17th last, includes two representatives of the Conference of Chief Officials of the London Electric Supply Companies. The names of these gentlemen, Mr. W. A. Pearman and Major H. Richardson, should have appeared in the announcement as representing their organisation on the committee.

Fatality.—An explosion resulting in the death of one electrician and serious injuries to another, occurred on July 28th at the Clyde Navigation Trust electric power station, Govan Graving Dock, Glasgow. Deceased, Alex. Marshall (22), Shettleston, was ascertaining the pressure generated by the main air compressor motor. There was an explosion and the cover of the air compressor motor was blown through the glass roof of the building and struck a man working in another part of the pressure house. Considerable damage was done to the building.

Educational.—WEST HAM MUNICIPAL COLLEGE.—Day and evening courses in civil, mechanical, and electrical engineering have been arranged at the College. Particulars from the Principal of the College. (See our advertisement pages to-day.)

Ship-Shore Telephone Communication. — The cable ship *Faraday*, owned by Messrs. Siemens Brothers & Co., Ltd., of Woolwich, recently returned after a voyage to South America during which she carried out the laying of a submarine telegraph cable for an Italian cable company between the island

Siemens Portable Receiver in Brazil.

of Fernando Noronha (off Brazil) and Rio de Janeiro. It is of interest to note that during the operation communication between the vessel and the island was maintained both ways by means of radio telephony with the aid of the receiving apparatus shown in the accompanying illustration. The set is the standard Siemens portable type-M.I.P. receiver.

Irish Free State Electricity Bill.—The Electricity Supply (Special Powers) Bill, 1925, which has been read a second time in the Saorstat Eireann appears to be of a sweeping character, as it seems to place the whole of the electricity supply industry at the disposal of the Minister of Industry and Commerce. The Bill has been drawn up to allow all electricity generating undertakings to render mutual assistance and enable them to meet the normal demand until power becomes available from the State River Shannon hydro-electric scheme. Its object is to save the expenditure of money on new plant, which might be rendered useless four or five years hence by the State scheme referred to. Such additional plant might in Dublin alone involve an expenditure of £40,000 or £50,000. When an agreement is entered into in pursuance of a requirement of the Minister he is to settle its terms, and voluntary agreements are to be subject to his approval. Local authorities may borrow money under the Electricity (Supply) Acts, 1882 to 1919, for the purpose of carrying out such agreements, and the Bill is to supersede all existing provisional orders and Acts of Parliament. The Committee stage of the Bill has been fixed for November 3rd, 1925.

Aluminium Alloys.—From a paper read recently before the American Society of Mechanical Engineers by Messrs. R. Streeter and P. Faragher, dealing with the properties of alloys of aluminium, *Machinery* give some interesting notes. It is pointed out that by the addition of relatively small amounts of other elements to commercially pure aluminium, it is possible to produce alloys which possess very satisfactory mechanical properties and good foundry characteristics, and at the same time retain in a large measure the desirable properties of the commercially pure metal. The most commonly-used alloying elements or "hardeners" are copper, silicon, zinc and manganese, and to a lesser degree nickel and magnesium.

In comparing the accuracy with which aluminium alloy products can be produced, the following comparison is of interest. For die castings tolerances are discussed in thousandths of an inch, for permanent-mould castings in thirty-seconds and sixty-fourths, while for sand castings tolerances are considered in eighths and sixteenths. In a table showing the mechanical properties of some of the more commonly used alloys the following figures are of interest. With a composition consisting of 10 per cent. copper, 1.2 per cent. iron and 0.25 per cent. magnesium, the maximum tensile strength in lb. per sq. in. is given as 30,000; the maximum elongation per cent. in 2 in. as 1.5; and the Brinell hardness number as 85-105. With 10 per cent. silicon the maximum tensile strength is 29,500; 5.5 silicon and 4.5 copper, 29,500; 10 copper, 29,000; 5.5 copper, 1.0 iron and 1.0 tin, 26,500.

Russian Railway Electrification.—According to the *Railway Gazette* it was decided at a recent meeting of the Gosplan (State Planning Commission) to begin work on the electrification of the Moscow suburban railways, and the Commissariat of Ways and Communications was requested to proceed at once with the preparation of a plan so that the work could be started in October. An expert is to be sent abroad to study questions connected with the electrification of railways.

Radio Engineers and the I.E.E.—QUALIFICATIONS FOR MEMBERSHIP.—The Institution of Electrical Engineers has issued the following statement:—Recent correspondence in the Press indicates that there is some misconception as to the eligibility of wireless engineers for membership of the Institution, and it is therefore necessary to state that it is possible for an engineer to become a member with qualifications of a purely wireless nature. For the admission of wireless engineers to the class of associate member (A.M.I.E.E.) it is necessary, in addition to the possession of adequate professional experience for a period of at least two years, in the case of those who do not possess an exempting examination qualification, or do not submit a satisfactory thesis, to pass the A.M.I.E.E. examination in the following subjects:—(1) English essay, or translation from a foreign language, (2) applied mechanics; (3) heat, light, and sound, or inorganic chemistry; (4) electricity and magnetism; and (5) wireless and high-frequency engineering.

The Committee of the Wireless Section of the Institution has recently considered the above syllabus, and is of opinion that it represents the minimum amount of professional knowledge which a qualified wireless engineer should possess. No conditions are laid down by the Institution as to how or where an applicant may have obtained his training. For others who are unable to pass the examination, there is provided the class of Graduates, but it must be pointed out that admission to this class does not confer any professional standing, the requirements being a good education and employment in an engineering or scientific capacity in the applications of electricity. In order to become a member of the Wireless Section it is necessary that the member of the Institution shall be actively engaged in the study, design, manufacture, or operation of wireless or high-frequency engineering apparatus. The meetings of the Wireless Section are not, however, confined to members of the Section, but are open to all members of the Institution.

It has also been stated that the Committee of the Wireless Section consists nearly always of the same body of men. This is not the case, as the rules of the Section provide for the retirement of one-third of the ordinary members of the committee each year. Some valuable suggestions have emerged from the recent correspondence, and will receive the careful consideration of the Wireless Section Committee, more particularly as regards the type and number of papers read and as to increasing the activities of the Section outside London. As regards the suggested formation of a new society, the Wireless Section Committee considers there is no need for it, because, as indicated above, wireless engineers can obtain membership of the I.E.E., and amateurs are already catered for by the Radio Society of Great Britain.

New Leeds Generating Station. — The Electricity Committee brought before the City Council, on July 29th, a proposal that application be made to the Electricity Commissioners for power to borrow £865,000 for the first portion of a proposed new generating station for the city. The City Council approved of the recommendation without discussion and Mr. N. Hefford, city electrical engineer, and representatives of the Committee will interview the Commissioners. Mr. Hugh Lupton, chairman of the Electricity Committee, has stated that the demand in Leeds is growing so quickly that it is obvious that in a few years the big station at Whitehall Road will be inadequate, and therefore steps must be taken to secure additional supply. He did not state where the proposed new station might be, but said it would not be at Whitehall Road. In 1912 there was a proposal in Leeds to establish a very large station on a special site and expert advice was taken. It was decided, however, that for the time being and for a number of years the need could be met by extensions and alterations at the Whitehall Road works which have enabled that works to carry on up to the present time, when the output is about five times as much as in 1912. Possibilities of further extensions at Whitehall Road are now exhausted. Asked for further details, Mr. Lupton said: "Until the project has been discussed and decided by the Commissioners, there is nothing more to be said about the scheme."

Long-Burning Flame Arc. — Some particulars are given in the *Illuminating Engineer* of a new German enclosed flame arc lamp which is claimed to work for 125 hours without recarboning, and even 140 hours' burning has been obtained in some recent tests. The consumption of the lamp is approximately 0.25 W per c.p. (mean spherical), and it operates at from 7.5 to 10 A. Carbons can be furnished to give white, yellow or red-orange light, the last being preferred in cities where fogs are frequent. Exhaustive tests of these lamps have recently been carried out, and several have been erected for comparative tests with 1,000-W gas-filled incandescent lamps.

Accident.—By accidentally touching a cable, an electrician is reported to have been seriously burned in a street manhole in Glasgow on August 3rd.

A H.p. Phase Testing Device.—The accompanying illustration, fig. 1, is of a device, described in *Power*, designed for phasing out feeders, transformers, &c., on a 6,600-V system. The apparatus consists of two metal points, each connected to one of the inner coatings of two Leyden jars. The outer coatings of the jars are connected by means of flexible leads to the terminals of a neon lamp. The Leyden jars are mounted

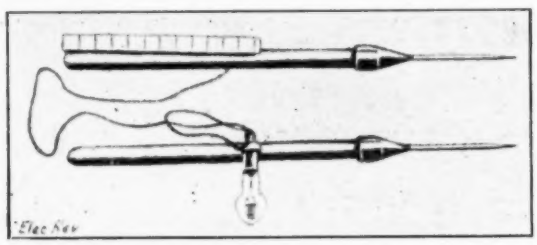


Fig. 1.

in handles of dry, well-seasoned and varnished beechwood. The top parts, which carry the metal points, are made of bakelite. The jars are made of glass tube, ¾-in. in diameter and 5½ in. long, with a 1/16-in. wall closed at one end. The outer coatings are of brass tubing and the inner of tinfoil. The

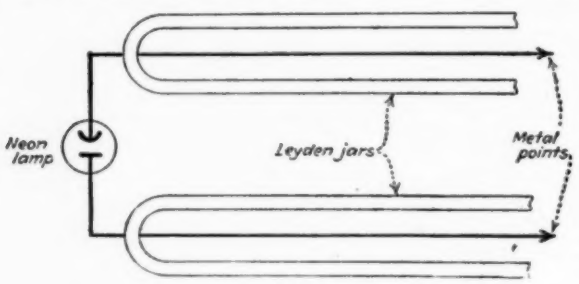


Fig. 2.

lamp is mounted on one of the handles. In operation the metal points are brought into contact with the conductors under test, and if a pressure difference exists between them, the lamp glows, and the operator is subjected to a minimum of risk. The device gave indications up to 20,000 V on test. A sketch diagram of the connections is shown in fig. 2.

Appointments Vacant.—Instructor in electrical engineering (two evenings per week), for Technical Institute, Kingston-on-Thames; two charge engineers, chief draughtsman, and switch control room attendant, for Wolverhampton Corporation. (See our advertisement pages to-day.)

Women Want Electricity.—The Plymouth Corporation has received a request from the local Co-operative Women's Guild that it shall insist upon all new houses being electrically wired for both cooking and lighting purposes.

Institution Notes.

Institution of Electrical Engineers.—CHARTERED ELECTRICAL ENGINEERS IN THE IRISH FREE STATE.—Under the by-laws of the Institution of Electrical Engineers, its corporate members are designated "Chartered Electrical Engineers," and the care exercised by the Institution in admitting to corporate membership has conferred a definite professional status of a high order upon such members. It is satisfactory to know that the Irish Free State Government recognises this, and that the corporate members of the Institution practising in the Free State are regarded by it as possessing full professional qualifications.

In view of the altered conditions in 1925, the Council of the Institution specially authorised the Committee of the Irish Centre, which meets in Dublin, to advise the Irish Free State Government on matters concerning electrical engineering, if such advice is desired, and although no official steps have as yet been taken, the relations between the Free State Ministry of Industry and Commerce and the Irish Centre have been entirely satisfactory. Informal assistance has been given whenever asked for, and there is little doubt that in any legislation which may be effected in the future the position of chartered electrical engineers in the Irish Free State will be fully safeguarded.

Iron and Steel Institute.—Among the 18 papers to be read at the Autumn Meeting of the Iron and Steel Institute, which will be held at the University, Edmund Street, Birmingham, from September 9th to 11th, are "High-Frequency Induction Furnaces," by Mr. D. F. Campbell, and "The Magnetic and Electrical Properties of Cast Iron," by Mr. J. H. Partridge.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

Luton Corporation has increased the salary of its electrical engineer from £1,000 to £1,200 per annum.

The Brighton Corporation Lighting Committee recommends the following increases of salary:—Mr. CHRISTIE, chief electrical engineer, from £1,450 to £1,650 per annum; Mr. G. CLAUGHTON, assistant engineer, from £750 to £850; and Mr. G. T. JOYCE, assistant manager, from £600 to £700 per annum.

At a meeting of the Engineering Advisory Committee of the South-East Lancashire Electricity Advisory Board on July 28th, Mr. W. J. H. WOOD, the borough electrical engineer of Bolton, was appointed chairman in succession to Mr. S. L. Pearce, and Mr. S. J. Watson, of Salford, was appointed vice-chairman. Mr. Pearce's successor at Manchester, Mr. H. C. Lamb, was welcomed by Mr. Wood upon joining the Committee.

The Lancaster Town Council has decided to increase the salary of Major G. C. MILNES, borough electrical engineer, from £600 to £680 per annum.

The impending departure of the manager of the Walsall Corporation tramways (Mr. C. BURGESS) to take up an important post in the East was the subject of a special reference at a meeting of the Town Council recently, when a resolution was unanimously adopted expressing regret at his resignation and high appreciation of his services. The Midland Association of Municipal Tramways has presented to Mr. Burgess a gold watch and to Mrs. Burgess a silver tray.

The Preston Town Council has appointed Mr. J. A. ROBERTSON, consulting engineer for four years from January 1st, 1925, at a salary of £400 per annum, in connection with the new electricity undertaking. His services are to be retained in connection with the installation of the third turbo-generator at Ribble power station and of the Blackburn and Preston joint cable.

The Ilford Urban Council has decided to consolidate salaries of officials as under as from April 1st last:—Mr. A. H. SHAW, electrical engineer, £997 10s., based upon the scale fixed by the I.M.E.A., but supply to the tramway undertaking to be calculated upon basis of 50 per cent.; Mr. L. E. HARVEY, tramway manager, £835; Mr. H. H. SIMPSON, works superintendent, £330, rising by £10 a year to a maximum of £350; Mr. J. C. RICHARDS, traffic superintendent, £310, rising by £10 a year to maximum of £350.

Mr. FREDK. J. COLLIS has been appointed secretary to the Electrical Accessories Manufacturers' Association, and communications may be addressed to him on behalf of the Association at the offices, 39, St. James's Street, London, S.W.1.

The English Electric Co., Ltd., announces that, during the absence on leave of Mr. P. J. PYBUS, Mr. VICTOR WATLINGTON will act as managing director of the company.

Mr. C. H. GOODWIN has been appointed assistant electrical engineer to the Bangor Corporation. He was formerly works superintendent.

The International General Electric Company announces that Mr. CLARK H. MINOR, former vice-president of the company, has been elected president to succeed Mr. Anson W. Burchard, who has been both president and chairman of the board. Mr. Burchard will continue as chairman. Mr. Minor recently returned from Europe, and Mr. Burchard left to proceed there. Mr. LOREN EMERY, former assistant merchandising manager of the company, has been made general merchandising manager. Mr. R. G. HENDERSON, who has been in Europe for the past year and a half conducting important negotiations for the company with particular reference to merchandising lines, has been relieved of the duties of general merchandising manager, and has been assigned to special work in connection with problems of sales promotion.

The Keighley Corporation has fixed the salary of the borough electrical engineer (Mr. H. WEBBER) as from April last at a minimum of £800 per annum, with an allowance of £20 for every complete 1,000,000 kWh sold above 10,000,000 kWh in each financial year, and as from April 1st, 1926, £20 for every reduction of .03d. in the works cost in each financial year below the figure for the year ending March 31st, 1926.

Mr. JOHN H. PARKER, deputy electrical engineer to the Croydon Council, has been appointed borough electrical engineer at West Hartlepool, at a salary of £1,015 per annum. There were 88 applicants for the position. Mr. Parker was educated at Bath and Weston-super-Mare, and served his apprenticeship with Messrs. Alley & McLellan, of Glasgow. While an evening student at Glasgow Technical College he won the Malcolm Ker bursary for Natural Philosophy tenable for three years

at the day classes, and took the electrical engineering course. On the recommendation of Dr. Magnus Maclean, Professor of Electrical Engineering, he was given a junior position on the staff of the Greenock electricity department, and in four years rose to be works superintendent of the new power station, which had a refuse destructor attached as an adjunct to the main boiler house. Three years later he was given the position of staff engineer and was later appointed chief assistant engineer. In 1915 he went to Croydon as deputy electrical engineer, and during the last five years has been engaged principally on the complete reconstruction and extension of the power station of that undertaking, involving a change of periodicity and the application of 3-phase generation to an existing single-phase network. Mr. Parker has been closely identified with the recent movement for improving the qualifications, status and conditions of employment of supply engineers. He was one of the original members of the Chief Technical Assistants' Association of London, which was formed in 1915, and was one of the two delegates sent by that body to negotiate an amalgamation with the newly-formed E.P.E.A. At the first National Executive Council of the E.P.E.A. Mr. Parker was elected a vice-president, and he was closely identified with all the negotiations in 1919, resulting in the Stoker award of 20 per cent. plus £90 and the formation of the National Joint Board. In 1920 he succeeded Mr. Lunn and became the second president of the E.P.E.A. During his year of office the Stoker award was increased from 20 per cent. and

Mr. John H. Parker,
who has been appointed Borough Electrical Engineer at West Hartlepool.

£90 to 20 per cent. and £120, and he captained the group of four which negotiated the salary schedule and conditions of employment and was largely responsible for the tactics which led to that award being adopted by the large majority of undertakings throughout the country. When the salary schedule was revised in 1922, he was again a member of the negotiating committee.

Obituary.—Many of our readers will desire to join with us in expressing deep sympathy with Sir Charles and Lady Bright on the death of their only son, Mr. GEOFFREY C. C. BRIGHT, who passed away on July 30th, aged 23, at a nursing home, after a long illness.

SR. A. PEREIRA.—The death recently occurred in Lisbon, at the age of 72 years, of Sr. Alfred Pereira, a former Director-General of the Portuguese Post and Telegraphs. The deceased, who started life as a postman, presided over the International Telegraph Conference in Lisbon in 1915.

PROF. OTTO LUMMER.—The death recently occurred of Prof. Dr. ing. Otto Lummer, for many years director of the Physical Institute of the University of Breslau.

MR. H. L. WILLIAMS.—We regret to record the death which occurred on July 25th, at the age of 52 years, of Mr. Hugh Lawrence Williams. A correspondent of *The Times* states that after Mr. Williams left Charterhouse and Trinity College, Cambridge, he qualified as an electrical engineer. "He was one of the principals in the firm of Balfour, Beatty and Co., Ltd., since its inception in 1909, and, indeed, had been associated with Mr. George Balfour, M.P., the head of that firm, for some ten years before. He was thus closely concerned in the electric supply and other public utility enterprises with which his firm was identified, and, particularly on the technical side, did much to assist in their successful development."

New Companies Registered.

Cleartron Radio, Ltd. (207,568).—Registered as a public company on July 29th, with a nominal capital of £55,000 in 50,000 8 per cent. cumulative preference shares of £1 and 100,000 deferred shares of 1s. The residue of the distributed profits remaining after paying the dividend on the preference shares is to be divided amongst the deferred shareholders. In a winding up the assets available for distribution are to be applied in repaying capital on the preference shares, and any residue remaining divided amongst the deferred shareholders. Objects: To acquire the registered trade marks "Cleartron" and "C.T.," and to adopt an agreement with A. H. Carlisle and to carry on the business of manufacturers of wireless instruments and parts, electrical fittings, loud speakers, valves, telephones, accumulators, batteries, glassware and kindred articles, &c. Minimum cash subscription, £7. The directors are:—A. H. Carlisle, Trafalgar Buildings, 1, Charing Cross, S.W., merchant banker (managing director); T. F. Grundy, Copthall House, Copthall Avenue, E.C., incorporated accountant. Qualification (other than first directors appointed by the subscribers), 500 shares. Remuneration, £158 each per annum (chairman, £350), free of income tax. Solicitors: De la Chapelle and Co., 34/6, Gresham Street, E.C.2. Registered office: Trafalgar Buildings, 1, Charing Cross, S.W.1.

Kathoxyd, Ltd. (207,560).—Private company. Registered July 28th. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on at 41, High Holborn, W.C.1, by W. Wolsey, as Kathoxyd, together with the exclusive rights to use the name "Kathoxyd," and to carry on the business of manufacturers of and dealers in chemical compounds, metals and mineral ores, and other substances used as crystal detectors for wireless receiving sets, in particular the crystal known by the above name, manufacturers of and dealers in wireless sets and accessories, &c. The permanent directors are:—W. Wolsey, 29, Gloucester Road, Finsbury Park, N.4 (director, Sylvex, Ltd.); A. Zeitlin, B.Sc., A.S.C., 144, Theobalds Road, W.C., chemist. Qualification, 1 share. Registered office: 41, High Holborn, W.C.1.

Swan Radio Co., Ltd. (207,562).—Private company. Registered July 28th. Capital, £200 in £1 shares. Objects: To carry on the business of wholesale and retail manufacturers and repairers of all wireless apparatus and accessories, &c. The first directors are:—J. F. Dolan, 41, Orchard Road, Sutton; C. B. Kersting, 1, Elmworth Grove, West Dulwich. Secretary: J. F. Dolan. Registered office: 18, Kingsland Road, Shoreditch, E.

Finston Manufacturing Co., Ltd. (207,423). — Private company. Registered July 22nd. Capital, £10,000 in £1 shares (6,000 cumulative preference shares and 4,000 ordinary). Objects: To carry on the business of manufacturers of and dealers in electrical batteries, lamps and torches, hand, cycle and other lamps, electrical instruments, and novelties, films, brackets, globes, filaments, shades, glasses, &c. The managing directors are:—G. F. A. Stone, 22, Hooking Green, Pinner, manufacturer; P. R. Shackel, 32, Rodway Road, Roehampton, S.W., manufacturer. Qualification, £100. Remuneration, £50 each per annum. Solicitors: Turner & Co., 80, Chancery Lane, W.C. Registered office: 45, Horseferry Road, Westminster, S.W.

Thomas & Stinchcomb, Ltd. (207,541).—Private company. Registered July 27th. Capital, £2,000 in £1 shares. Objects: To acquire the business of an electrical engineer now carried on by E. A. Stinchcomb at 6, Narrow Wine Street, Bristol, as "Thomas & Stinchcomb." The permanent directors are:—E. A. Stinchcomb, A.M.I.E.E., Camden House, St. Michael's Hill, Bristol, chartered electrical engineer; P. J. Strong, 46, Northville Road, Felton, Bristol, salesman. Qualification, £1. Registered office: 6, Narrow Wine Street, Bristol.

Liskeard Gas and Electricity Co., Ltd. (207,549).—Registered July 27th. Capital, £8,000 in £1 shares. Objects: To adopt an agreement with F. T. Depree, S. Simpson, C. J. Ennor, W. H. Huddy, J. Sweet and A. E. Knight, to manufacture, sell and supply light, heat and power in the borough of Liskeard and vicinity, &c. Minimum cash subscription, 7 shares. The first directors are:—F. T. Depree, "Newlands," Exeter, gas engineer; S. Simpson, "Meresyke," Exmouth, engineer; C. J. Ennor, "Hollywood," Liskeard, statutory civil engineer; W. H. Huddy, Dean Terrace, Liskeard, retired jeweller; J. Sweet, "St. Malo," Liskeard, granite merchant; A. E. Knight, The Parade, Liskeard, bank manager. Qualification, £1. Remuneration (except managing directors) as fixed by the company. Secretary: J. C. Isaac. Registered office: The offices of J. C. and C. Isaac, Pondbridge, Liskeard, Cornwall.

Flinders (Wholesale), Ltd. (207,521).—Private company. Registered July 25th. Capital, £7,000 in £1 shares (4,000 ordinary and 3,000 convertible 8 per cent. preference). Objects: To acquire the wholesale portion of the business of Flinders, Ltd., now carried on at 121, High Street, Colchester, and to carry on the business of wholesale dealers only in the apparatus connected with wireless telegraphy and telephony, and accessories, &c. The directors are:—A. F. Hitchcock (chairman and managing director), 121, High Street, Colchester (managing director of Flinders, Ltd.); G. C. F. H. Vernon (general manager), Grove Hall, Retford, Notts (both permanent subject to each holding £500 shares). Remuneration, £500 each per annum. Secretary: Miss Winnie Blomfield. Solicitors: P. A. Moodie, Excel House, Princes Court, Whitcomb Street, Pall Mall, W.C. Registered office: 18, Butt Road, Colchester.

Coventry Magneto Co., Ltd. (207,481).—Private company. Registered July 24th. Capital, £100 in £1 shares. Objects: To acquire the business of manufacturers of magnetos and magneto parts carried on by W. C. Couch and C. F. H. Foster at Foleshill, and at Grey Friars Lane, both in Coventry, and certain of the assets. The first directors are:—W. S. Couch, Fedalma, Solihull, Warwickshire, merchant; C. F. H. Foster, 24, Beaconsfield Road, Stoke, Warwickshire, engineer. Remuneration as fixed by the company. Solicitors: Rowlands & Co., 41, Temple Row, Birmingham. Registered office: Grey Friars Lane, Coventry.

Official Returns of Electrical Companies.

International Wireless Manufacturers, Ltd.—H. Smith, A.L.A.A., F.I.S.A., of 4, York Buildings, Adelphi, W.C.2, was appointed receiver and manager on July 17th, 1925, under powers contained in debentures created December 2nd, 1924.

G.W.I. Valves, Ltd. — L. A. Bartlett, of 639, Salisbury House, E.C.2, was appointed receiver and manager on July 16th, 1925, under powers contained in debenture dated December 2nd, 1924.

Midget Lamp Company (1924), Ltd.—Particulars filed of £500 debentures authorised July 10th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Warnolite, Ltd. — Issue on June 30th of £110, and on July 7th, 1925, of £30 debentures, parts of a series already registered.

Wainwright Manufacturing Co., Ltd.—Issue on July 20th 1925, of £1,000 debentures, part of a series already registered.

Shenton & Co., Ltd. — Particulars filed of £4,000 first mortgage debentures authorised July 16th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital (if any), the amount of the present issue being £3,500.

F. J. Jones & Sons, Ltd. — Charge on the company's undertaking and property, present and future, dated July 20th, 1925, to secure all moneys for which the mortgagees may become liable by virtue of a guarantee given to the company's bankers to the extent of £1,000. Holders: Mrs. V. B. Harvey, Deganwy, Church Hill, Aldershot; and W. Ridley, Maesmaur, Llangollen.

J. Churley Cann, Ltd.—Particulars filed of £900 debentures authorised July 23rd, 1925, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

W. H. Franklin (Cardiff), Ltd.—E. C. Phillips, of Princes' Chambers, 4, Working Street, Cardiff, was appointed receiver on July 16th under powers contained in debenture dated March 23rd, 1925.

W. S. Laycock, Ltd. — Charge dated May 5th, 1925, to secure £106,153 19s. 2d., charged on the company's undertaking and property, present and future, except uncalled capital, ranking after the charge created by deed poll of even date in favour of Bentinck Coathupe as receiver or manager, but priority to trust deed dated June 27th, 1919, securing debenture stock and interest thereon and all other moneys thereby secured except that any sums hereafter accruing due to the trustees for their remuneration and in respect of costs, charges and expenses incurred by them shall rank as a charge on the property in priority to the charge now created. Holders: Barclays Bank, Ltd. Registered July 19th by permission of the Court.)

H. G. Cooper, Ltd.—Land Registry charge on certain freehold land and buildings in the parish of St. Saviour, London. Holders: E. Edwards and C. E. Edwards, 193, High Street North, East Ham.

Colne Valley Electric Supply Co., Ltd.—Trust deed dated July 4th, 1925, to secure £75,000 debenture stock, charged on the company's undertaking and property, present and future, including uncalled capital. Trustees: Union Commercial Investment Co., Ltd., Dashwood House, 69, Old Broad Street, E.C.2.

Rose Bros. Electrical Co., Ltd.—Issue on July 16th, 1925, of £1,000 debentures, part of a series already registered.

Midget Lamp Co., Ltd. (old company).—L. Jacobs, of 3, 4 and 5, Queen Street, Cheapside, E.C., ceased to act as receiver or manager on July 20th, 1925.

Watford Electric and Manufacturing Co., Ltd.—Satisfaction to the extent of £500 on May 31st, 1925, of mortgage debenture dated May 31st, 1923, securing £3,000, leaving £2,000 unsatisfied.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Marconi's Wireless Telegraph Co., Ltd.

The annual meeting was held on July 31st, Senatore G. Marconi presiding. In proposing the adoption of the report (*vide* our last issue, p. 189), the chairman, after dealing in detail with the accounts, said that with the issue of 500,000 new shares last February the directors considered that they had sufficient funds to enable them to carry out their present programme of Empire, European, and other foreign services. Last year he referred at some length to the revolutionary changes which were taking place in long-distance communication by the introduction of the beam system, in conjunction with the discoveries which he and the technical staff of the company had made with regard to short waves. Since last August tests and researches carried out under his direction had proved conclusively that still shorter waves were capable of covering world-wide distances as well, and perhaps better, by day than by night, thereby ensuring communication with such distant parts of the Empire as Australia and Canada for the whole of the 24 hours. During recent tests carried out continuously for four days and four nights, communication had been maintained with Australia and Canada. For that reason he felt that they were justified in stating in the report that "there is good reason to anticipate that the company will not only be able to carry out the guarantees of performance which it has given the Home and Dominion Governments, but that these guarantees will be substantially improved upon." Dealing with the objective which the directors had had continually before them for some years past, namely, the creation of a world wireless telegraph system, he said that the original telegraph services opened by the company were necessarily of an experimental nature, but in more recent years each circuit had been added with the knowledge that it would be a complete success from the date of opening. During 1924 they handled 32 per cent. more telegraph traffic than in the previous year. The equal rates quoted by the competing radio and cable routes had not been brought about by the raising of the radio rate, but by a reduction of the cable rate to the wireless level. This equalisation, which took place on their main transatlantic services in the middle of 1923, might have been expected to have caused a considerable diminution in the number of radio telegrams, yet there was an increase of traffic in the service to New York of no less than 22.87 per cent.

The Right Hon. F. G. KELLAWAY, P.C., managing director, in seconding the motion, said he felt it incumbent upon him to speak with complete frankness as to the position of the company. In the last two balance-sheets the directors had been compelled to allocate a sum of over £3,000,000 from the general reserve account to meet extraordinary losses and to write down various assets. Two years ago the general reserve stood at £3,986,354. In the present accounts that reserve had been reduced to £1,043,120. These were figures which demanded the fullest explanation. Before he could give that explanation he must say something of what had happened during his association with the company. He had now been associated with the company for over two and a-half years, and had held the position of managing director for eight months. About 18 months ago it became clear that under the organisation then existing the directors were not receiving such information with regard to the world-wide interests of the company and its financial commitments as would enable them properly to discharge their responsibility to the shareholders. As soon as he was convinced of that fact, he proposed to the board that a finance committee of directors should be appointed to control the financial and general policy of the company. That committee was formed on June 3rd, 1924, and as soon as it got to work it became obvious that drastic changes in the company's methods were required. They were especially disturbed by the fact that their interests in subsidiary and associated companies were being taken into the accounts at figures which did not represent their real value. They were also disturbed by the growth in the company's expenditure—a growth which had gone on at the same time that shareholders were being asked to accept a lower return on their capital. The finance committee went through every one of the interests in the company's books, and examined them with a full determination to write down the figures to real values. Last year it wrote down to the extent of £2,335,608. This year it had had to make a further writing down to the extent of £677,985. The shareholders would naturally ask if finality had been reached or if they would be faced next year with yet another drastic cut in the company's reserves. He could not prophesy as to the future, but he could assure them that in the general reserves of £1,043,120 which now appeared in the balance-sheet they believed that they had real and substantial values. If conditions abroad improved there should be corresponding appreciation in the reserve; if the course of foreign currencies continued unsatisfactory, still further writing down might be required. The directors realised that their first concern must be to proceed as rapidly as possible to rebuild the reserve, and a step would be taken in that direction this year by placing to the credit of the reserve the premium of 7s. 6d. per share on the 500,000 shares issued in February last. Referring to the future, Mr. Kellaway said he had abundant faith in the future prosperity of the company. His faith was based principally on the intrinsic value of the work of Senatore Marconi and his brilliant assistants. But there were other reasons for confidence. During the past six months they had made a number of agreements with some of the principal electrical and broadcasting companies in this country and abroad for an exchange of patent rights and for the payment of royalties. These should have a favourable influence on the revenue of the company. The progress already made with the beam stations under construction for the Government and in the Dominions and India was satisfactory, and the whole of those services should be working before the end of next year. The Canadian and South African services should be in operation before the end of this year. The revenue from the Dominion end of these services and the royalty which the Government would pay to them on the receipts from the home stations would constitute entirely new sources of revenue. They had taken in hand the reorganisation of certain subsidiary companies which in the past had lost money. Referring to the arbitration by Lord Buckmaster on their claims against the Government, he said that the preliminary stages were proceeding as rapidly as the nature of the work would permit. He could not anticipate the date when Lord Buckmaster would be in a position to make an award, or the amount of the award, but every step would be taken properly to present the case of the company to the arbitrator so as to ensure that the company received just and adequate compensation for the use made by the fighting forces of the company's patents both before and during the war. In conclusion, Mr. Kellaway referred to the beam system, and paid a tribute to the genius of Senatore Marconi. The report and accounts were adopted.

Yorkshire Electric Power Co., Ltd.

The report for the half-year ended June 30th last states that the progress of the company and the rate of new connections have been maintained in spite of the unsatisfactory trade conditions in Yorkshire, and the directors feel justified in declaring interim dividends at the rate of 6 per cent. per annum on the preference and ordinary shares as in 1924. Referring to the failure of negotiations with regard to the West Riding (Aire and Calder) Electricity District scheme, the directors state that they consider it impossible to hold up any longer the development of the area covered by the original powers conferred upon the company. They have therefore decided to proceed at once to make a supply available throughout the whole of the area covered by the existing powers of the company. The construction of the new station at Ferrybridge is proceeding and the first generating set will shortly be delivered for erection. Mr. E. R. Benson has been appointed to the board.

French Companies.

The *Compagnie de Signaux et d'Entreprises Electriques*, of Paris, reports net profits of 2,500,000 fr. for 1924-25, and a dividend at the rate of 15 per cent.

The *Société l'Equipement Electrique*, of Puteaux (Seine) and Paris, reports a gross turnover of 6,293,000 fr. in 1924, as against 4,874,000 fr. in the previous year. As a result of a fire at a depôt last year, the net profit only amounted to 53,000 fr.; this has been carried forward.

Electrical Distribution of Yorkshire, Ltd.

In announcing an interim dividend at the rate of 7 per cent. per annum, the report for the half-year to June 30th states that during that period there has been a large increase in the sale of electricity and considerable developments have taken place in the company's areas of supply. The company is making application for a number of new Orders for supply which can be economically worked with existing undertakings. To meet the increased demands the nominal capital is to be increased to £500,000. If this is approved an issue of capital will be made to the shareholders in the coming autumn.

Wellman Smith Owen Engineering Corporation.—The profit for 1924, after providing for taxation, was £16,039; the sum brought forward makes available £32,568. An interim dividend at the rate of 5 per cent. was paid, but the directors do not recommend a further dividend and propose to carry forward £19,918.

Fuller's United Electric Works, Ltd.—The meeting adjourned from July 27th, at which a resolution creating a prior lien debenture for £75,000 in favour of the bank and increasing the rate of interest on existing stock, is to be continued on Monday next, August 10th.

City of London Electric Lighting Co., Ltd.—A dividend of 1s. per share has been declared on the ordinary shares for the half-year to June 30th.

Tokyo Electric Light Co.—*The Times* reports that a New York syndicate offered during the current week $24 million of 3-year 6 per cent. gold notes of this company. The issue price was 98¼. The company has recovered rapidly from the effects of the earthquake, its revenue now being at a very high leve'. It has never paid less than 8 per cent., and since the earthquake the dividend has been raised to 10½ per cent.

Enfield Cable Works, Ltd.—The directors' report for the year ended June 30th last, which is to be submitted at to-day's annual meeting of the company, show a profit of £100,107, to which is added £14,892 brought forward, making £114,999. Directors' fees, depreciation, and interest require £10,659, leaving £104,340. The preference dividend absorbs £65,000, an interim dividend of 5 per cent. on the ordinary shares took £10,103, and it is proposed to pay a final dividend of 15 per cent. on the ordinary shares (making 20 per cent. for the year), requiring £30,308. The reserve receives £14,849 (making it £20,000), and a balance of £34,079 is carried forward.

Para Electric Railways and Lighting Co. Ltd. — The directors announce that interest of 2½ per cent. is to be paid on the 5 per cent. debenture stock for the six months ended May 31st last, together with interest at the rate of 7 per cent. per annum for the three months to August 31st next.

Brompton and Kensington Electricity Supply Co., Ltd.—An interim dividend at the rate of 10 per cent. per annum, free of tax, has been declared on the ordinary shares, and one at the rate of 7 per cent., less tax, on the preferred shares. Similar dividends were paid last year.

Bristol Tramways and Carriage Co., Ltd.—The directors have declared an interim dividend at the rate of 3 per cent. (less tax) for the half-year ended June 30th on the ordinary shares.

Chelsea Electricity Supply Co., Ltd.—An interim dividend at the rate of 9 per cent. per annum has been declared on the ordinary shares.

City of Buenos Ayres Tramways Co. (1904), Ltd.—A dividend of 1s. 3d. per share (at the rate of 5 per cent. per annum) has been declared in respect of the three months ended July 31st.

Westminster Electric Supply Corporation, Ltd.—An interim dividend at the rate of 1s. per share has been declared for the half year ended June 30th (as in 1924).

Swan, Hunter & Wigham Richardson.—An interim dividend of 3 per cent., free of tax, has been declared on the ordinary shares, as last year.

Thomas Bolton & Sons, Ltd.—A final dividend of 2½ per cent. is being paid (making 5 per cent. for the year, as before) and £19,523 is carried forward.

Stocks and Shares.

MONDAY EVENING.

CUSTOM, linking arms with the interest which comes from looking back, dictates, at this week in the year, the matching of current Stock Exchange prices against those that ruled seven months earlier. At this particular juncture, markets are suffering from the after-effects of the disturbance produced by the upheaval in the coal trade. Bank Holiday made a merciful intervention between worries and work. The Stock Exchange separated, for the three days' holiday, in a subdued frame of mind. August is nearly always a stagnant period in stocks and shares, and even the rubber share optimists admit the strong probability of business remaining languid until the later autumn, as the prophets vaguely forecast.

The influence of the threatened miners' lock-out made itself felt in most Stock Exchange markets, but the electricity supply section suffered singularly little from the effects of the crisis. Present quotations are below the top prices reached since the end of last year, but the passage of the two Electricity Bills, in the spring, sufficed to keep the list firm, notwithstanding the inevitable profit-taking which followed the materialisation of long-protracted eager hope.

How the market has fared, on balance, over the past seven months, this table shows :—

Ordinary Shares.	Dec. 30th, 1924	Now.	Rise or fall.
Brompton ...	1⅝	1⅞	− ⅛
Charing Cross	2 3/16	21/4	+ 1/16
Chelsea ...	37/6	37/6	—
City of London	47/6	45/9	− 1⅝
County ...	52/6	52/6	—
Kensington	10½	12½	+2
London ...	33/6	33/-	−6d.
Metropolitan	1⅛	88/3	+9d.
St. James' ...	12⅝	13⅜	+ ¾
South London	2⅛	2 1/16	+ 1/16
Westminster	11	11¼	+ ¼

In the above group, it will be observed, with interest, that the Kensington and St. James's shares are the only surviving members of the £5 denomination. The others are now all of £1 each, and the alteration has done much to render the share market more flexible. The change has taken place without it? leading to any noticeable increase in mere speculation. All the fears that used to be entertained on this score have been disproved by what has actually happened.

The outstanding feature amongst cable issues is a rise of £9 in Indo-Europeans. Apart from this, the variations are of no great consequence, as this comparison illustrates :—

Share.	Dec. 30th, 1924.	Now.	Rise or fall.
Anglo-American Pref. ...	104½	102½	−2
Eastern Extension	17	17⅛	+ ⅛
Eastern Telegraph	17⅛	17⅜	—
Globe Ord. ...	17⅛	17⅜	+ ¼
Great Northern ...	29⅞	31	+1⅛
Indo-European ...	32½	41½	+9
Marconi	1 1/16	1⅛	− 1/16
United River Plate	6 15/16	7⅛	+ 3/16
Western Telegraph	17	16½	− ½

Marconis have proved a source of disappointment to their supporters. The dividend of 10 per cent. is being maintained, but the reserve fund has had to be reduced. Nothing more has been received from the Government in respect of war claims. When the money which is still owing is finally paid, this will go to fortify the reserve.

Home Railway stocks have experienced a bad time. For not more than a fortnight at a stretch has the market been free from alarms and excursions of one kind and another. Traffics have been poor. The Wembley Exhibition is no extra bull point. With the threatened lock-out of miners, and a general transport strike on top of it, railway stockholders have in many cases decided to put in the knife and to cut their losses. The Underground group published a batch of dividends less encouraging than had been expected. Here are the price comparisons :—

Stock.	Dec. 30th, 1924.	Now.	Fall.
Central London Ord. ...	74	69½	4½
Metropolitan ...	83	69½	13½
District	56	45	11
Underground Ord.	8½	2½	12/6
" "A"	9/6	7/-	2/6
" Inc.	100	98	2/-

News of the "strike settlement," as it was called, came too late to affect prices on the eve of the holiday. There was the customary newspaper talk of record Bank-holiday crowds, &c., although the weather uncertainties may make their force felt in the traffic statistics. Home Rails offer good yields on the basis of the last-paid dividends. Doubt is felt as to whether the rates may not have to be cut; the Metropolitan and the District Railways should, however, find no great difficulty in keeping up their distributions.

The boomlet in rubber shares served to concentrate attention upon the market, and, at the same time, it led to a slight dulness in prices of shares in companies that are large users of the product. Nevertheless, the result of this year's working is favourable in many cases to proprietors of manufacturing shares, as these prices show :—

Share.	Dec. 30th, 1924.	Now.	Rise or fall.
Babcock	2⅜	2 7/16	− 1/16
British Aluminium ...	29/3	30/9	+1/6
Callender's ...	2 1/16	2⅛	+ 1/16
General Electric ...	21/6	24/-	+2/6
Henley's	2⅛	2⅛	—
India Rubber ...	17/6	19/6	+2/-

Johnson & Phillips have risen substantially to 45s., on the idea that the dividend, at present 10 per cent., may be raised by degrees to 15 per cent. Enfield Cable Works have also spurted sharply, to 3 1/16, on publication of an excellent report. General Electrics increased their dividend by 2½ per cent.—from 5 to 7½ per cent.—and Siemens are now paying 7½ per cent. Most of the companies in this group are doing well. Engineering shares reflected, in their falling values, the failure of trade to revive in the "heavy" industries. The boomlet in rubber shares stands out as a feature of the year, having come about by reason of a rise from 1s. 6d. per lb. to 4s. 6d. per lb. in raw rubber. A sharp reaction led to a general setback in rubber share prices.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price July 31, 1925.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	13	14	2¾	—	5 0 10
Brompton Ordinary	1	10	10	1¾	—	*5 14 3
Charing Cross Ordinary	1	14½	15	46/9	—	6 8 2
do. do. do. 4½ Pref....	1	4½	14½	17/6	—	5 2 10
Chelsea	1	12	12	1⅝	—	6 8 0
City of London	1	15	15	45/9	—	5 11 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	30/-	—1/-	5 3 3
County of London	1	15	15	52/6	—	5 14 3
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	20/6	—	6 14 7
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation ...	1	10	10	33/3	—	6 0 4
Kensington Ordinary	5	14	15	12¾	—	5 17 8
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	10	33/-	—6d.	6 1 2
do. do. 6% Pref.... ...	5	6	6	5½	—⅛	5 7 10
Metropolitan	1	10	11	38/3	—	5 15 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	23/3	—	5 4 4
Newcastle-on-Tyne Ordinary ...	1	6	7	22/6	—	6 4 5
do. 5% Pref. ...	1	5	5	18/3	—	5 9 7
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	13¾xd	—	6 1 10
South London	1	15	15	2⅞	—	6 3 1
South Metropolitan Pref. ...	1	7	7	1¾	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref. ...	1	6	6	20/-	—	6 0 0
Westminster Ordinary	1	15	15	45/-	—	6 13 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—	7 13 10
Yorkshire Elec.	1	8	8	29/6	—	5 8 6
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	68	—	5 17 8
Metropolitan	,,	4	5	69½	—	7 3 11
do. District	,,	3½	3½	45	—	7 15 7
Underground Electric Ordinary	10	Nil	Nil	2½	+⅛	Nil
do. do. "A" ...	1/-	Nil	Nil	7/-	—	Nil
do. do. Income	Bonds	6	6	98	—	*6 2 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	109½	—	5 17 1
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	3	6	2⅛	—	2 18 2
Chili Telephone	5	6	5	5⅜	—	*4 13 0
Cuba Sub. Ord.	10	5	5	6⅞	—	7 8 2
Eastern Extension	10	10	10	17⅛	—	*5 16 9
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 15 11
Globe Tel. and T. Ord.	10	10	10	17⅜	—	*5 15 1
do. do. Pref.	10	6	6	10⅞	—	5 10 4
Great Northern Tel.	10	22	22	31	—	7 1 11
Indo-European	25	7	8½	41½	—	*4 4
Marconi	1	10	10	1⅜	—	7 5 6
Marconi Marine	1	10	7½	18 9	—	8 0 0
Oriental Telephone Ord. ...	1	12	12	2⅜	-	*5 12 11
United R. Plate Tel.	5	8	8	7¼	—	5 12
Western Telegraph	10	10	10	16½	—	*6 3 1
HOME AND FOREIGN TRAMP, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	3½	—	8 16 0
do. do. 2nd Pref. ...	5	6	6	2½	—	10 4 4
do. do. 5% Deb. ...	Stock	5	7	71½	—	6 15 2
British Electric Traction Ord. ...	,,	6	6	112	—	5 7 2
do. do. 6% Pref. ...	,,	6	6	104	—	5 15
Brazil Traction	100	4	4	60½	—½	6 11 10
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	88½	—1	5 11 9
do. do. Preferred	,,	96/-	96/-	83½	—	*5 15 0
do. do. Deferred	,,	129/5	129/5	102	—	*6 7 0
do. do. Deb.	,,	4½	4½	76½	—	5 11 1
Lond. & Sub. Trac. 5% Pref. ...	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	43½	—	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	62½	—	8 0 0
Mexican Light Common ...	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	58	—	Nil
do. 1st Bonds ...	—	5	5	83•	—	7 17 6
Yorkshire (West Riding) ...	1	5	—	17/6	—	5 14 3
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	27/-	—	*4 18 6
British Aluminium Ord.	1	5	10	30/9	+9d.	6 12 6
British Elec. Transformer Pref.	1	Nil	7	17/6	—	... ...
British Insulated Ord.	1	15	15	3½	—	4 18 0
Brush Ord.	1	10	10	1	—	10 0 0
Callenders	1	15	15	2¾	—	5 4 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	¾	—	... ...
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	30/6	—	6 11 2
Enfield Cable, Pref.	1	7½	7½	1½	-	6 0 0
English Electric	1	5	5	17 9	—	5 14 8
do. do. Pref.	1	6	6	20/6	-	5 17 1
Gen. Elec. Prof.	1	6¾	6¾	23 6	—	5 10 8
do. Ord.	1	5	7½	24/-	—	6 5 0
Henley	1	15	16	2½	—	5 8 11
do. 4½% Pref.	5	4½	4½	4¾	—	5 6 0
India-Rubber	1	5	5	19/6	—fd.	*5 2 6
Johnson & Phillips	1	10	10	2½	—5/6	4 9 3
Met Vickers, Ord.	1	8	8	20 9	—	7 14 6
do. Pref.	2	8	8	22	—	6 14 9
Siemens Ord.	1	—	7½	25 9	+9d.	5 16 9
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price August 4th.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	5½d.	...
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£89	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£25	...
a Copper Sulphate ... ... ,,	£35 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	5½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Commercial ... ... ,,	£7 15s.	...
a ,, Roll ... ... ,,	£7 15s.	...
a Soda, Chlorate ... ... per lb.	3½d. to 3¾d.	...
a ,, Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£120 to £125	...
b ,, Wire ... ... per lb.	1/9 to 2/6*	...
b ,, Sheet ... ... ,,	1/8 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I ... ... per ton net	£239	£8 dec.
Grade II ... ... ,, ,,	£169	£7 inc.
Grade III ... ... ,, ,,	£93	£3 inc.
c Brass (rolled metal 3" to 12" basis) per lb.	9½d.	½d. inc.
c ,, Tubes (solid drawn) ... ,,	11¾d. to 1/-	...
c ,, Wire, basis ... ... ,,	10½d.	½d. inc.
c Copper Tubes (solid drawn) ... ,,	1/1	...
c ,, Bars (best selected) ... per ton	£91	£1 inc.
c ,, Sheet ... ... ,,	£91	£1 inc.
c ,, Rod ... ... ,,	£91	£1 inc.
d ,, (Electrolytic) Bars ... ,,	£67 15s.	10s. inc.
d ,, ,, Sheets ... ,,	£148 10s.	...
d ,, ,, Wire Rods ... ,,	£77 15s.	10s. inc
d ,, ,, H.C. Wire per lb.	9¾d.	⅛d. inc.
f Ebonite Rod ... ... ,,	2 - to 3/6	...
f Sheet ... ... ,,	2 - to 3/6	...
n German Silver Wire ... ... ,,	2/8	...
h Gutta-percha, fine ... ... ,,	3/9	6d. inc.
h India-rubber, Para fine ... ... ,,	4/1½	½d. inc.
l Iron Pig (Cleveland Warrants) ... per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£21	£3 dec.
g Lead, English Pig ... ... ,,	£18 5s.	£2 inc.
g Mercury ... ... per bot.	£13 15s. to £14	5s. dec.
e Mica (in original cases) small ... per lb.	2d. to 3/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/7½	...
p ,, ,, wire ... ... ,,	1/8½	½d. in.
o Platinum ... ... per oz.	4?-	...
d Silicium Bronze Wire ... ... per lb.	1/6½	...
r Steel, Magnet, in bars ... ... ,,	7½d.	...
e Tin, Block (English) ... ... ter ton.	£264 15s. to £264 15s.	£3 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
n Richard Johnson & Nephew, Ltd.
o P. Ormiston & Sons.
p Johnson, Matthey & Co., Ltd.
r C. Clifford & Son, Ltd.

W. F. Denn s & Co.

I.E.E. Wiring Regulations (Buildings).—Consideration of the comments and suggestions made in connection with the eighth edition of the I.E.E. Regulations for the Electrical Equipment of Buildings issued about a year ago has indicated to the Wiring Rules Committee that much of the criticism which has arisen has apparently been due to a misunderstanding of the objects underlying some of the clauses. This will be dealt with in the next revision by amending the wording of the clauses in question. A few amendments have, however, been considered by the Committee to be of sufficient urgency to warrant their immediate publication, and on the recommendation of the Committee the Council has decided to issue these in the form of an alteration sheet. Other amendments, not materially affecting principles, are under review, including those arising in connection with the difficulty experienced in some cases in wiring standard plugs with flexible cords and cables of the sizes recommended in the regulations. This matter is still under consideration jointly by the Institution and the B.E.S.A. from the point of view of whether it is preferable to alter the I.E.E. rating of flexible cords and cables, or to amend the dimensions of standard plugs. In connection with the alteration to Condition (xviii) in Regulation 87, Class T1, it has been urged that screwed steel-conduit fittings complying with British Standard Specification No. 31 are unnecessarily heavy and costly, and the B.E.S.A. has accordingly been asked to reconsider this specification. Pending its revision, the Regulations do not require conduit fittings to comply with it. Copies of the alterations can be obtained on application to the secretary of the Institution, Savoy Place, Victoria Embankment, London, W.C.2.

The First International Congress of Radiology.

Exhibition of X-Ray and Electro-Medical Apparatus.

(*Continued from page* 192.)

In addition to various social functions, arrangements were made for the delegates to visit a number of the London hospitals and the Radiology Division of the National Physical Laboratory; a selection of radiograms was on view at the British Institute of Radiology, while X-ray, electro-medical, physical, and other apparatus was exhibited by some 30 British, American, French, German, and Dutch manufacturing firms at the Central Hall, Westminster.

One of the most important subjects discussed by the Congress, as indicated last week, was the demand that has arisen for higher voltages than can be commercially obtained by the use of transformers; this has given fresh impetus to the search for means of energising X-ray tubes which shall be both efficient and capable of precise control. Immersed induction coils are efficient in so far as the actual excitation of the tube is concerned, but they would scarcely be described as instruments of precision; moreover, a coil, as also the ordinary type of transformer, is intermittent in action, the efficiency increasing with frequency of impulse, from which it is evident that constant-pressure apparatus would be more efficient electrically and therapeutically, in that dosage could be standardised as regards source and due allowance made for other variable factors. Such a current can be obtained by employing closed-core transformers, the impulses from which are fed into condensers through valves of the electronic or hot-cathode types, two condensers being used with each transformer, so that the whole cycle of the alternating current is used and maximum pressure obtained.

The Gaiffe-Gallot Apparatus.

This has been done experimentally by various workers, Hull (of the General Electric Co. of Schenectady) having so transformed 150 volts a.c. to 92,000 volts with a fluctuation of approximately 1 per cent., or even less for lower voltages, but it has been left to Messrs. Gaiffe-Gallot et Pilon, of Paris, to place upon the market the first constant-pressure apparatus with an output of 250,000 volts and sufficient amperage to run two tubes, having a fluctuation of less than 5 per cent. For this apparatus Messrs. Watson & Sons (Electro-Medical), Ltd., have obtained the sole manufacturing rights for Great Britain and Ireland. Fig. 1 is a diagram showing the method employed, with two transformers in series to attain the output stated above, while figs. 2 and 3 are a plan and general view of the apparatus respectively. The two h.p. transformers T (rated at 75,000 volts) are connected in series, each charging two condensers C to 62,000 volts, the margin allowed tending to prolong the duration of each discharge and so augment the constancy of the resulting current; the capacity of the condensers is approximately 0.02 microfarad. The four electron valves are designated K, while X is the Coolidge tube and F (*t* in fig. 2) the transformer for heating its filament; M is a milliamperemeter at earth potential, and V a voltmeter reading to 250,000 V in steps of 5,000, the intensity of the current measured being reduced for safety by two resistances of 1,000 megohms each. A_1, A_2 are the h.p. positive and negative terminals respectively; the fuses for the valve transformers are marked *f*, the valve filament voltmeters *m*, their controlling resistances *r*, and the valve filament transformers t_1 t_2 t_3 t_4, and L is a sphere gap.

The installation illustrated is capable of furnishing 10 mA at 250,000 V with a variation of intensity of less than 5 per cent. at full load when fed with 50-cycle a.c. The control cabinet to be seen on the

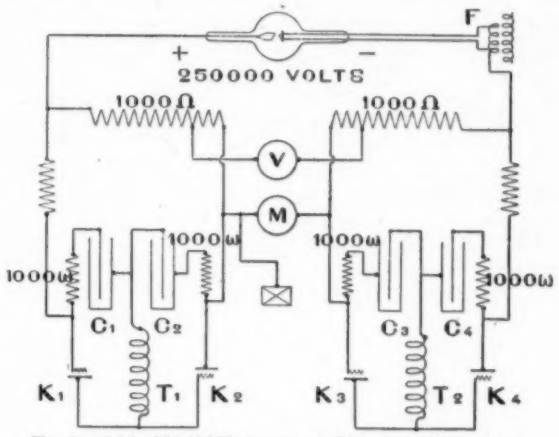


Fig. 1.—Gaiffe 250,000-V Apparatus; Diagram of Connections.

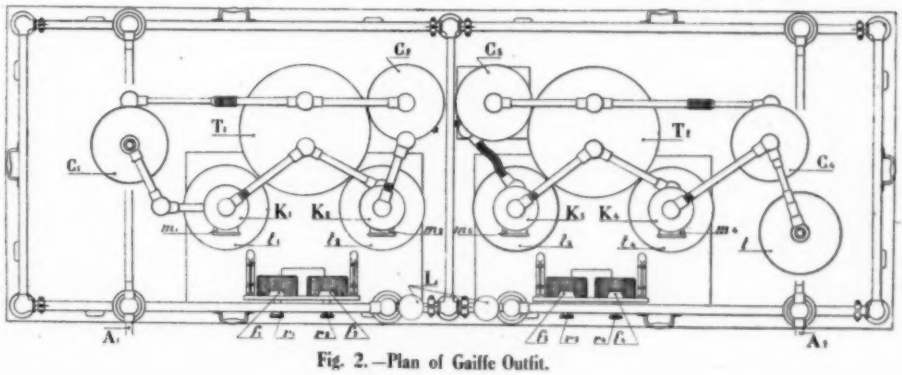


Fig. 2.—Plan of Gaiffe Outfit.

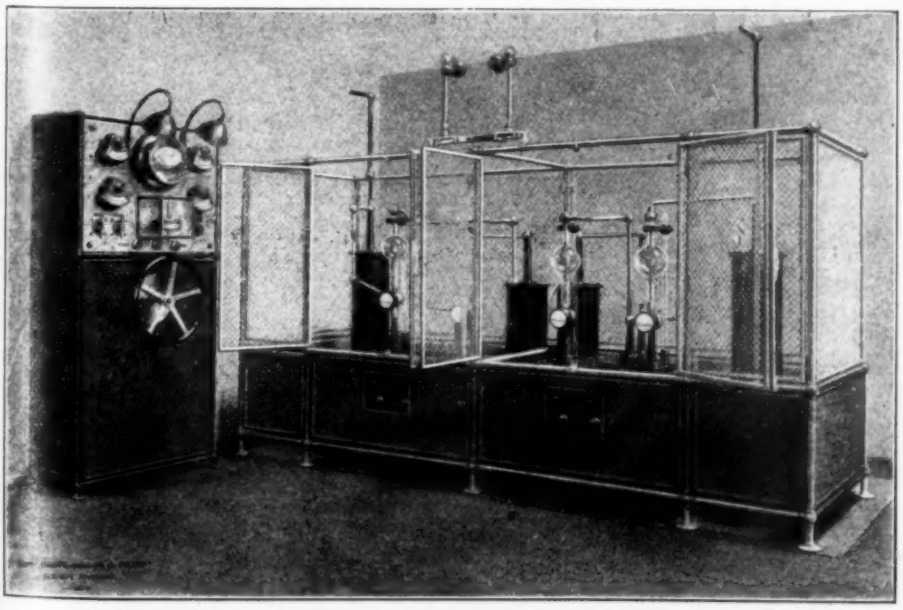


Fig. 3.—General View of Gaiffe Outfit.

left of fig. 3 contains a choke coil, which is regulated by the large wheel shown, above which in the square glass case is the milliampere meter used for measuring the intensity of the X-ray emission at any moment and therefore the dosage when calibrated. The generator described above was only one item of Messrs. Watson's large exhibit; for instance, amongst their newest products is a portable X-ray outfit made up into packages for hand carriage. Four packages comprise everything necessary for use on a.c. not exceeding 125 volts, one additional package being necessary for higher alternating voltages, and two when required for use on d.c., and the output reaches 90,000 peak volts, despite which the set can be connected up to an ordinary domestic lighting circuit. The radiator Coolidge tube is specially constructed for this apparatus, differing in size and method of protection from the standard pattern, and the transformer is oil-insulated, with an additional coil wound over one of the h.p. secondaries for heating the cathode filament, and is fitted with a sphere gap.

"Solus" Transformers.

The "Solus" Electrical Co. has adopted oil insulation for all its transformers, irrespective of size, it being of the opinion that wax insulation will not stand the test of time. Each transformer is filled with oil in vacuum so as to exclude air pockets and, moreover, all the company's insulators are oil-filled also. The outfit shown in fig. 4 is specially made for operating a 30-mA, self-rectifying, hot-cathode X-ray tube, and represents simple apparatus for diagnostic work. Owing to the absence of any moving part, it is silent and most compact, while the only floor space required is that taken by the control unit, which is about 15 in. in diameter. The transformer is mounted on a wall bracket, and the filament transformer is fitted in the same tank that houses the h.p. unit. The control table is all metal and carries a foot-operated exposure switch, which can also be used for controlling room light, and a cable is provided for this purpose within the one multiple cab-tire cable. The auto transformer gives as many as 45 settings with only two volts between each, and the means of regulating milliamperage and penetration are quite independent. The company's 10-mA outfit is claimed to be the lightest made; its total weight is no more than 90 lb., of which the transformer accounts for 44 lb.

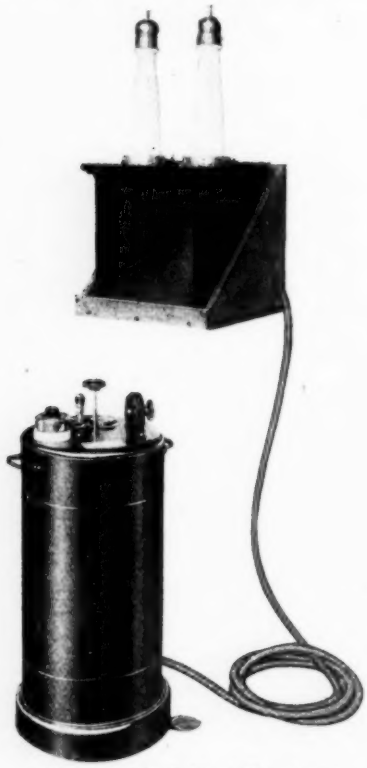


Fig. 4.—"Solus" 30-mA Transformer and Control Gear.

"General Radiological" Apparatus.

Amongst the various apparatus of the General Radiological and Surgical Apparatus Co., Ltd., much interest was shown in Prof. Holfelder's field selector, which is said to be probably the most accurate means of ascertaining the ports of entry on a patient and, at the same time, of determining the exact dosage for the part to be irradiated.

Of the firm's X-ray apparatus, the "Peo" set shown in fig. 5 is specially constructed for use with Coolidge tubes, and attention may be drawn to its simplicity of manipulation and high output (100 mA at 75 kV).

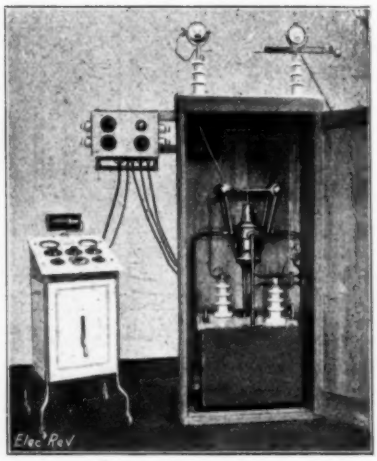


Fig. 5.—"Peo" X-ray Outfit.

For deep therapy the company showed its latest radiating device, namely, Prof. Wintz's tube stand and exposure table, fig. 6; the former is characterised by its extremely easy movement and the excellent protection which is afforded by the tube that encloses the Coolidge tube entirely, so that no rays can pass any way except through the compressor to the patient. This tube box has been passed by the National Physical Laboratory as complying with the requirements of the British X-Ray Protection Committee. The exposure table is of the oil-pump type and allows very fine adjustments in any direction, all movements being on ball bearings. The "Polydor" apparatus is the company's most powerful diagnostic set; it is provided with valve-tube rectification, and is also noiseless when working. Various accessories were also on view, such as the plate-changing device for successive photographs, metal cassettes, and "Sinegran" intensifying screens. The "Clinoscope," fig. 7, is an examining apparatus with motor-driven movements which can be used as a screening stand or couch, and by means of which patients can be examined or photographed in any position and at any angle. This apparatus is a very fine specimen of mechanical construction.

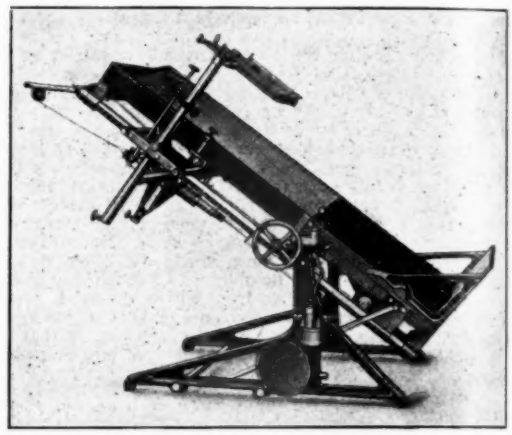


Fig. 7.—A Motor-driven "Clinoscope."

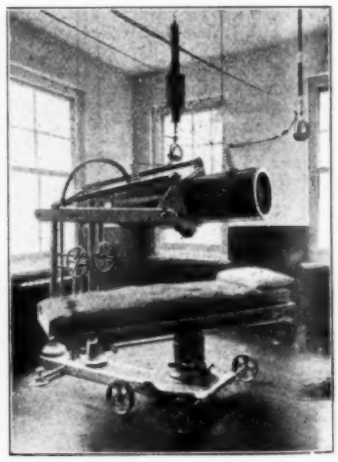


Fig. 6.—The Wintz Irradiating Device.

(To be continued.)

Indian Railway Development.—Some items of interest concerning the development of the Indian railways are given in the *Railway Gazette*. All the railway companies have in hand numerous constructions of new lines, remodelling of yards and stations, and improvements in carriage and wagon supply. The construction has just been sanctioned of 26 miles of railway of 5 ft. 6 in. gauge by the Bengal-Nagpur Railway from Barkakana, South Karanpura Colliery, to Chandi. The Madras & Southern Mahratta Railway has in hand the construction of a marshalling yard at Tondiarpet, increased lighting arrangements, renewal of rails, girders and engines, and the elimination of level crossings. The Nizam's Guaranteed State Railway has in mind a big scheme for overhauling the old workshops at Lalaguda and remodelling them for the requirements of the next ten to fifteen years. It is estimated that the provision of suitable cranes, pneumatic and electrical equipments alone, will amount to nearly Rs. 5 lacs. Mr. G. R. G. Huddleston is in charge of this remodelling scheme.

Italian Trade and Industry.

The Development of National Production.

MESSRS. J. H. HENDERSON, O.B.E., and H. C. A. Carpenter, Commercial Secretaries at the British Embassy, Rome, have forwarded to the Department of Overseas Trade a report,* revised to March, 1925, upon the commercial, industrial, and economic situation in Italy.

The report commences with a general review of the economic position in which it is declared that in this respect Italy is stronger than she has been at any time since the war. In public finance there is a good prospect of the Budget balancing in the current year; the internal national debt is lower; and the revenue from taxation has been increased by a re-assessment of the value of property and better methods of collection. The cost of living is high, due principally to the dependence of Italy upon foreign foodstuffs and raw materials, and the question of employing the surplus population is acute. It is thought that this surplus will have to be absorbed by industry as the land is already supporting as many workers as it can bear. From the point of view of British export trade, it may be said that the present economic situation of the country is such as justly to inspire confidence in the credit and stability of the market. At the same time, it is becoming increasingly difficult for British manufacturers and traders to secure and retain a footing in Italy, largely on account of the growing competition from local industries, and they cannot afford to spare any effort if they are to achieve success.

In reviewing the financial position, the report says that among the industries in which the banks are principally interested are the electrical, traction, and metallurgical industries. During 1923-24 there was a net increase of 588 million lire in the capital invested in the electrical industry. Italian financiers have provided funds for the construction of electrical works outside Italy, including investment in the "Steweag," a hydro-electric undertaking in Styria; and the Société des Forces Hydro-électrique de Syria, in which an Italian group is said to be financing the construction to the extent of 100 million lire. As regards the investment of foreign capital in Italy, it is said that a certain amount of foreign capital has been attracted in connection with the concession of the telephones and radio-telegraphy and telephony to private enterprise.

Foreign Trade and Market Conditions.

It is shown that the United Kingdom took the second largest share of Italy's import trade in 1922, 1923, and 1924, the amount increasing each year to 2,176 million lire out of a total of 19,388 million lire in 1924. The United States occupied the first place, Germany coming third (reparation imports being excluded). Details of Italy's electrical imports and exports were published in our issue of June 12th (p. 953). The report says that Germany has always been foremost in the manufacture and supply of electrical apparatus for, and she still heads the list of countries which export to, Italy. There is every reason to suppose, however, that in time Italy will become more and more independent of outside assistance. The largest generators as well as the smallest motors can be turned out by the Italian factories, which are dependent on foreign material but can command excellent technical skill, and, with training and experience, production is bound to improve. Great Britain has little place in this market, her principal contributions being in items other than the above. It is interesting to note that orders for transformers for South America have been placed in Italy, though German influence has hitherto been predominant in that part of the world. The majority of the accessories (not including certain accessories for motor-cars) for the electrical trade can be manufactured in Italy to-day. There are also several factories turning out electric lamps, which were previously derived from Great Britain and Holland. Swedish and American firms have been making a speciality of metal goods such as electric vacuum cleaners and electrical household and barbers' requirements, selling them in Italy at prices far below those charged for similar articles in England.

The delay in the reorganisation of the telephone and telegraph systems has hindered business in this direction. The arrangements for the transfer of the telephones to private enterprise are now, however, well advanced, and when they are complete it may happen that the increased demand which is bound to occur for apparatus will divert a portion of the trade to Great Britain. There is certain to be a brisk demand for radio receiving sets, and British manufacturers may find it to their advantage to make certain sacrifices of prices to get a firm footing in this market, which is bound to develop.

Industry and Production.

The latest reports tend to show that Italian industries were, on the whole, actively employed during 1924, and some of them appear to have enjoyed a period of prosperity in marked contrast with the depression which they passed through between 1919 and 1922. Parallel with the electricity producing and distributing concerns, the electro-technical industry of Italy has continued to develop, and it is claimed that at present it can produce almost all the requirements of the country in electrical goods, including hydro-electric sets of any power. Electric meters were formerly imported from the United States and Germany; now the importers have to meet local competition. The only apparatus of which the production is not yet developed on a large scale are machines such as converters, transformers, and other appliances of a similar nature. The output of hydraulic turbines for Italy's power stations from five important firms and a few others up to the end of 1923 was 7,589 machines producing an aggregate of 3,337,274 h.p. It is stated that some of the firms propose to extend their activities into foreign markets. Other firms have specialised in batteries for lighting railway carriages and in accumulators. Electric wires and cables are made by a firm in Milan and Turin, which not only dominates the home market, but also does an export trade. Magnetos and electric incandescent lamps are also produced; the latter, however, are not manufactured in sufficient quantities to meet the national demand, which is more than double the production. As regards telegraphic and telephonic material, the greater part is imported from America or Germany, and a small proportion made in Italy in factories controlled chiefly by American or German groups. Radio material is largely imported, but is also made in the country by the Italo-Marconi Company in its factory near Genoa, and by other firms. The electro-technical industry has had a good season, and the factories have been able to run continuously both for home requirements and for export.

* Stationery Office, 4s. net.

Hydro-Electric Development.

According to a recent publication of the Consiglio Superiore delle Acque, 4,129 water-power concessions, covering 3,430,209 h.p., had been granted up to December 31st, 1923, and it was estimated that 60 per cent. of the power represented was in full use at that date. The capital invested in hydro-electric undertakings is stated to amount to 3,500 million lire, the average return upon this being 6.75 per cent. Plants capable of producing 2,209 million kWh annually are under construction, and plans have been prepared for a further 56 stations to generate 3,908.5 million kWh. The consumption of hydro-electric power in 1923-24 was about 6.5 milliards of kWh, which is considered to be equal to about 6.5 million tons of coal. The Tirso reservoir and hydro-electric plant in Sardinia (ELEC. REV., June 6th, 1924, p. 925) was formally opened by the King last year. The work on the dams of the artificial lakes on the Sila in Calabria is said to be advancing satisfactorily, and the first central station, generating 100,000 h.p., is due to be finished by the end of the current year. The linking-up of the various hydro-electric power stations of the Alps and the Apennines has already made some progress. The energy produced on the Adamello (Alps) is now transmitted when required to the Ligure-Toscana (Apennines); the Società Bresciana (Alps) transmits its energy to the Emiliana (Apennines) and *vice versâ*; the Edison Co. (Alps) has been linked up with the Emiliana Idroellettrica "Ligure" and Nevri (Apennines). Work is in progress for the interconnection of many other stations, and the network of lines which will thus be constituted will probably be the most powerful system of transmission of Alpine electrical energy in existence.

Railway Electrification and Construction.

During the year to June 30th, 1924, about 82 km. of line was electrified, bringing the total length of electric railway to 780 km.; a further 810 km. is in course of electrification. An Appendix to the report contains details of the lines already electrified or in course of electrification on July 1st, 1924. The most important of the lines already electrified is the Torino P.N. Ronco system (*via* Isola del Cantone), which has a length of 137 km. The sections in course of electrification include the Genova P.B.-Livorno, 181 km.; the Bologna-Firenze, 132 km.; the Roma-Sulmona, 172 km.; the Foggia-Benevento, 101 km.; and the Faenza-Firenze, 101 km. Work on the last line is at present suspended. The system of traction adopted is three-phase, 3,700 V, with two overhead wires. There are three exceptions to this, two of which employ direct current at 650 V (third-rail system), the other using direct current at 3,000 V (overhead wire).

It is reported that a provisional contract for the construction of an underground railway in Rome was signed, in August last year, by the Municipality and an Italo-French group. Plans have been submitted to a committee, which recommends an exhaustive examination to dispel the doubt which exists as to the possibility of carrying out the scheme. In the meantime the option granted to the Italo-French group is being contested by the Sindicato Italiano per la Metropolitana di Roma, which requires to have its scheme for the railway taken into consideration.

Telegraphy and Telephony.

Although no steps had been taken up to the end of last year to transfer the telegraphs to private management, a scheme for the transfer of the telephones was published in September last. This provides that the preponderance of the capital subscribed shall be Italian, and measures have been taken to prevent concessionaires from increasing the tariff

rates during the first three years; indeed, it is expected that a reduction will be effected by competition between the various groups.

Since the concession to the Società Italo Radio in 1923 of radio-telegraphic services, the company has been actively preparing itself for the functions which it has undertaken. Its capital is being increased from 7 million to 60 million lire, and technical and traffic agreements have been made with the Marconi interests, the Telefunken concern, and the Cie. Générale de T.S.F. to ensure the use of foreign patents and co-operation with other companies' stations in all parts of the world. The Italo Radio largely participates in the Compagnia Radiotelegrafica Brazileira and the Transradio Argentina. The station at Coltana was the first to be put into operation, the aerial system being improved and 800 kW of transmitting plant installed. From this station communication with South America is assured. Stations to deal with North American and European traffic are being erected. The second centre, at Rome, is to consist of two transmitting stations for European and trans-Continental traffic respectively, and there will be a third centre at Milan. Coastal stations for communication with ships will function at Genoa, Trieste, and Naples.

A Royal Decree of July 10th, 1924, approved the text of regulations governing broadcasting. Under these regulations a licence fee of 75 lire is charged upon each receiving set; of this the Government retains 25 lire, the balance going to the broadcasting concessionaire. A tax, of which 15 lire is payable to the Government, and from 20 to 180 lire (according to the number of valves) to the concessionaire must be paid before the apparatus is exhibited for sale. The Government reserves the right of increasing the fees by 300 per cent. in the case of foreign apparatus, but has so far made no use of this reservation. Broadcasting was commenced from the Rome station by the Società Unione Radiotelefonica Italiana in October last; other broadcasting stations are planned to be erected at Milan and Palermo.

Reference is made in the report to the submarine cables connecting Italy and America, and it is stated that a Royal Decree of December 13th last confirmed a convention with the firm of Pirelli (Milan), which conferred on the company the task of laying and keeping in order the submarine cables which are the property of the State.

Difficulties and Methods of Trading.

Under this heading one section of the report gives, as usual, information regarding the conditions to be met by traders. It is said that the activity of the Italian factories, while it may lead to a reduction of imports in a number of lines, may possibly result in a demand for the finer and more expensive qualities of goods in which British factories have always taken the lead. As we have already mentioned, German competition is severe, much of the success being due to the intensive campaign of German representatives in Italy. It is important for British traders to realise, as the Germans do, the necessity for securing that real acquaintance with the needs of the market which can only be obtained by means of personal visits by representatives with a thorough knowledge of Italian. If correspondence is resorted to, it should be in Italian, or, at least, in French, as should also catalogues and specifications. Italians in many cases are accustomed to giving long credits, and they expect the same treatment from abroad. It may be stated that a large number of German and a few American firms have decided to establish factories in Italy to avoid being driven off the market; in other cases a controlling interest has been obtained in Italian concerns. Price is, after all, the dominating factor; Italy is not a country which can afford to pay a higher price for a superior article when an inferior one which will answer the same purpose can be obtained more cheaply. The problem is not an easy one, because competitors, especially German and Italian, have often enough in reserve to drop their prices and still maintain a reasonable profit. It is the practice of some firms to discover what is the lowest British quotation and then quote 5 per cent. or or so less.

Boiler Explosion.—We have received a copy of the Report of a Preliminary Inquiry into the explosion which occurred at the power station, Upper Boat, Pontypridd, of the South Wales Electrical Power Distribution Co., when a superheater tube was fractured for a length of 7½ in. The explosion was caused by the tube becoming so reduced in thickness as to be unable to withstand the pressure to which it was subjected. As the superheater was not insured, it was not inspected at the time of inspection of the rest of the boiler.

A New Electric Hammer.

Centrifugal Force in the Conversion of Rotary into Reciprocating Motion.

At a recent interesting demonstration held at the headquarters of the Kango Co., Ltd., we were afforded the opportunity of seeing the application of an invention of Professor Goldschmidt, in which centrifugal force is used for the conversion of rotary into reciprocating and progressive motion, in a new electric hammer which this company is about to put on the market.

In the "Kango" hammer the reciprocating and progressive effect, which amounts to definite blows, is obtained by the rotation of two heavily loaded bevelled gear wheels placed facing each other, each driven through the same bevel pinion, carried by a spline shaft, in opposite rotational direction to the other. The weights of the loaded gear wheels are brought into juxtaposition at two points in their path of rotation in each revolution, each time converting their centrifugal force into a sharp oscillating motion forming the blow which is conveyed to the chisel or other tool through a transmitter held in position by an oil-retaining leather diaphragm; the recoil is taken by a spiral spring which serves to kill vibration and adds impetus to the blow on the tool. A section of the hammer, with the important features indicated, is shown in fig. 1.

The drive from the motor shaft to the spline shaft, of which the bevel pinion is an integral part, is taken through a special form of centrifugal coupling which obviates any sudden check on the spline shaft being conveyed to that of the motor. This coupling consists of a square box on an extension of the armature shaft, and two weighted links which fit in slots in the periphery of the box, and which are in turn connected by two pins to a driving piece fitted with internal splines making a free fit on the spline shaft. When the hammer is at rest the external points of the links are at the inside extremities of the slots at an acute angle with the driving piece, but as the speed rises they fly out in alignment with the driving piece and respond instantly to any retardation of the spline shaft, leaving the internally splined driving piece absolutely free on the shaft so that it can move up and down freely without friction.

The M.L. driving motor is universally wound for either 110, 200 or 220 V, and is encased separately with its brushes at the end nearest the stirrup handle and switch, the whole being ventilated by a special fan. An oil-tight joint separates the mechanical unit from the motor, the mechanical element running in an oil bath.

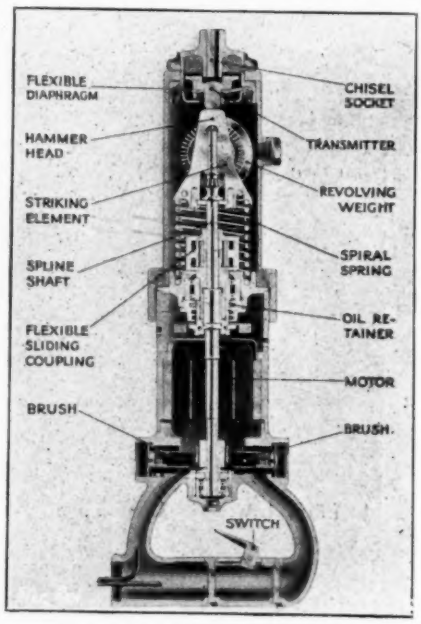


Fig. 1.—The Goldschmidt Hammer in Section.

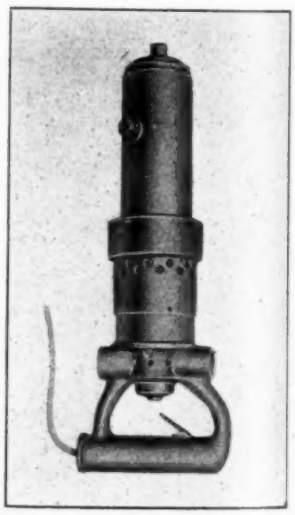


Fig. 2.—Exterior View of the Hammer.

The motor speed, which is in the vicinity of from 9,000 to 10,000 r.p.m., is reduced at the bevel gearing in the ratio of 3 to 1; the current consumption of the 220-V hammer is approximately 1.4 A.

It will be seen that, by virtue of the sliding coupling, the actual percussion blow of the hammer is essentially a floating one; this ensures against overloading the motor.

The hammer in its present state is not sufficiently powerful for ordinary riveting and work of equal weight, but after witnessing a few of its applications we feel assured that it has a wide field and that its prospects of superseding the pneu-

matic hammer are good. One most interesting point involved in the principle of the invention which favours the development of larger hammers is that variation in speed produces a harmonic variation in the reciprocating motion, and as the speed is increased, blows of proportionately increased intensity to those obtained at one blow per revolution of the crown wheels can be obtained at every second or third revolution.

Some of the demonstrated uses of the hammer were: chisel cross-grain cutting of wood, producing a smooth surface cut; strip cutting from 3/16 in. mild steel and groove cutting into mild steel; drilling and cutting into brickwork, stone and marble. A test on marble resulted in a ¾-in. hole being drilled 2 in. deep in 60 seconds.

Fig. 2 illustrates the external appearance of the hammer, the weight of which is 9.25 lb.

South American Electrical Notes.

(From Our Special Correspondent.)

AN electrical plant is to be constructed at Bluefields, Nicaragua. The market for wiring devices has broadened in this part of Central America of late, but, to a great extent, supplies are provided by American houses.

An electric light plant is to be installed at Cascavel, in the State of Ceará, Brazil. The concession has been granted for a period of 25 years, at the expiration of which time the plant will become the property of the municipality without compensation. No taxes are to be collected in the meantime, and the machinery and plant, for which tenders will be invited from abroad, will be allowed to enter the country free of duty.

The electric light and power plant established in Guayaquil, Ecuador, is about to be considerably extended, a foreign corporation having purchased a controlling interest in the undertaking.

With the plenitude of funds now at their disposal owing to the improved financial condition of Argentina, several of the British-managed railways in that Republic are proceeding with the work of installing large new electrical plants. While due attention has been, and is being, given to the requirements of the rapidly-extending suburban districts of the capital, additional facilities are being introduced into certain of the railway stations such as those of the Southern, at Plaza Constitución, and the Western. Further electrification on the Central Argentine line is also to be commenced this month (July), while the sum of 7,000,000 pesos (paper) has been allotted by the Pacific Railway Company for additional improvements and extensions at its terminus at Retiro. Among native-owned railway enterprises, the Spanish-Argentine Electricity Company (Compañia Hispano-Argentina de Electrícidad) is about to erect a new power-house which will considerably alter the appearance of, and increase the facilities provided in, the capital. The plans call for the erection of an electric power station with a machinery installation of 250,000 h.p. When this work has been completed the station—it is claimed—will rank with the largest in the world. It is expected that the construction and the installation of the specially planned equipment will be completed during the year 1927.

The Brazilian authorities, after considerable hesitation, have granted permission to the A.E.F.G. consortium (American, English, French, and German) for the construction of a large new radiotelegraphic station at the port of Pernambuco. The contractors have already been appointed, and are busy preparing plans and materials. It is estimated that the station cannot be completed before 18 months or two years from the date that the works are started. With seven towers, each 150 metres high, the station will be used primarily as a receiving relay station between Europe and the United States on the one hand, and between Rio de Janeiro and Buenos Aires on the other. Such an installation has long been regarded as indispensable for the maintenance of an uninterrupted service, because of the poor receiving conditions existing at Rio de Janeiro. In addition to the usual services, the Pernambuco station will deal with relayed transmitted messages from Rio de Janeiro and Buenos Aires. Much, however, will depend upon the sending conditions in the south. The station is being equipped to communicate directly with both the United States and Europe.

In Brazil, the sale of radio apparatus has fallen off considerably during the past few months. The slackness is said to be due to anticipated technical improvements. The greater part of the apparatus sold at present is of German origin.

From Peru it is learned that the recent inauguration of radio broadcasting created considerable local interest, with attendant good sales of apparatus. Owing to the existence of a local import monopoly of these manufactures, and the United States quota of 50 per cent. of total purchase having been exhausted, the remainder of trade demands must be purchased from the United Kingdom. It is understood that stocks of supplies are very low and importers are anxious to replenish them.

Notes from Canada.

(From Our Special Correspondent.)

ENGLISH readers will be interested in hearing of the winning of a $5,000 prize, offered by an American firm, by Mr. David Cowan, a young Englishman now resident in Canada. Messrs. Bonbright & Co., a firm of bond brokers in the United States, recently offered prizes totalling $10,000 for the best essay on the development of the electrical industry to cover the ten-year period 1920 to 1930. It will be seen that half of the period covered would require a description of actual events, while the other half would necessarily be prophetic. Mr. Cowan secured the first prize in competition with 437 others from various parts of the North American Continent. The judges in this competition, the American Superpower Corporation, have offered a single prize of $10,000 to be awarded to the competitor whose prophecies shall be found in 1930 to be most nearly correct for the five-year period 1925 to 1929.

Some three months ago the Hydro-Electric Power Commission of Ontario applied to the Dominion Government at Ottawa for permission to develop power on the St. Lawrence river near Morrisburg. This power site lies on a stretch of the river, the water rights on which, both for power and navigation, belong jointly to the United States and Canada. For this reason it was necessary for the application to be made to the Dominion and not to the Provincial (Ontario) Government. It has recently been announced that the application cannot be considered until the Joint Engineering Board, appointed last year by the two countries, has issued its report on the whole subject of power development on the St. Lawrence.

The statement has recently appeared in the daily papers that the Hydro-Electric Power Commission of Ontario has been granted permission to go ahead with the development of 250,000 horse-power on the Ottawa river at a cost of $25,000,000. This power will serve the needs of the eastern part of Ontario, which has so far had very little power available for local use.

An Ontario organisation, the Association of Municipal Electrical Utilities, recently held a convention at Niagara Falls, Ontario, and though Sir Adam Beck, chairman of the Hydro-Electric Power Commission, was unable to be present, he sent a letter in which he gave some interesting figures relating to the work of the Commission. During the past year the number of municipalities under contract with the Commission has increased from 356 to 386 and the aggregate amount of power generated by the Commission's various plants, in December, 1924, reached the total of 780,000 horse-power. In 1924 the capital investment in this provincial undertaking amounted to about $263,000,000 and the annual revenue is now nearly $19,000,000.

According to the *Electrical News* (Toronto) some three million horse-power is available for development in the province of Quebec on the following rivers:—Chicoutimi, Aux Sables, Shipshaw, Saguenay, the Peribonka, and others, all within a radius of 50 miles of the small town of Chicoutimi, which a year ago had about 9,000 people. This town now claims 13,000 or 14,000 owing to power developments in progress in the vicinity, as the Quebec Development Company is completing a plant of 500,000 horse-power capacity on the Saguenay river, and plans are now under way for the use of the same water, under twice the head, about twenty miles downstream.

As already mentioned in these pages, the Premier of Quebec, M. Taschereau, recently stated officially that the Cabinet had approved plans, submitted to the Government by certain interests, for the development of the Chute à Caron, involving an expenditure of about $75,000,000. The promoters propose to start almost immediately building a model town with a thousand houses. The interests referred to are said to have informed the Government that they intend to lodge a population of about 6,000 families, or some 30,000 people in the vicinity in the near future. The power is being developed primarily for the manufacture of aluminium.

Two Large Electric Winding Installations.—Particulars are given in *Chemical Engineering and Mining Review* of two large mine hoist equipments recently installed at the Porphyry shaft of the Inspiration Consolidated Copper Co., Inspiration, Arizona. Both are of the Ilgner-Ward Leonard type, an automatic one for ore hoisting, and a hand-operated one with automatic safety features for handling men. The ore hoist consists of a 2,150-h.p., 650-V, d.c. motor, running at 51 r.p.m., direct connected to the hoist drums; and a motor-generator set consisting of a 1,600-kW, 500 r.p.m., 650-V generator, a 1,900-h.p., 500 r.p.m., 6,600-V, 3-phase, 25-cycle, slip-ring induction motor, and a 78,000-lb. flywheel. This equipment is capable of lifting 10,000 tons of ore in 16 hours from a depth of 1,485 ft. The main hoist consists of a 600-h.p., 400 r.p.m., 550-V, d.c. motor geared to the hoist drum, and a motor-generator set consisting of a 450-kW, 750 r.p.m., 550-V, shunt wound generator; a 500-h.p., 750 r.p.m., 6,600-V, 3-phase, 25-cycle, slip-ring induction motor; and a steel plate 16,500-lb. flywheel. Except that a master switch and contactors are used for controlling the generator field instead of a drum controller, the control for this equipment is the same as used on other hand-operated Ward Leonard equipment.

Modernising Electric Tramcars.

Some Interesting London Experiments.

UNDER the deluge of criticism levelled against electric tramcars, the general public has almost lost sight of the fact that the modern tramcar, at any rate so far as London is concerned, is a very different vehicle to its pre-war brother. This is not surprising because no generally noticeable alteration has been made as regards external appearance, and with few exceptions, although the equipment has been vastly improved, the only visible difference internally has been the use of white paint.

During the past few years, however, Mr. C. J. Spencer, general manager of the three tramway companies associated with the London Underground group, has been fully considering improvements, and numerous tests and experiments have been carried out in order to discover what would best suit the peculiar and strenuous conditions of the traffic dealt with by his undertakings.

Modern Electrical Equipment.

In the first place, 40 cars have been fitted with new Metropolitan Vickers motor equipments and 70 with the latest types of magnetic brakes, and the following tables indicate the improvement which has taken place as the results of the improved acceleration. Starting from rest, the cars accelerated to the following speeds in the times stated :—

	Time taken from standstill.	
Speed.	New Equipment.	Old Equipment.
12 m.p.h.	8 sec.	9 sec.
14 m.p.h.	10 sec.	13 sec.
16 m.p.h.	13 sec.	19 sec.
20 m.p.h.	24 sec.	52 sec.

On a service test of 6 stops per mile, each stop being of 5 seconds duration, it was found that the cars fitted with old equipment averaged 11 m.p.h., whilst those having new equipment averaged 13½ m.p.h.

Speed on Grades.	New Equipment.	Old Equipment.
Grade 1 in 21	13½ m.p.h.	10½ m.p.h.
Grade 1 in 72	18½ m.p.h.	13½ m.p.h.

The new light-weight motors are provided with ball and roller bearings on the armature shafts; the weight of the motors is only 39 lb. per horse power, as compared with the 81 lb. per h.p. of the old motors, and it is interesting to note that the reduction in unsprung weight has resulted not only in very quiet and smooth running, but the experience gained after two years' running shows that there is a very distinct reduction in the liability of corrugations being formed on the rails.

Maag gears have been fitted to the cars, hardened by a special process, which has resulted in very quiet running, and

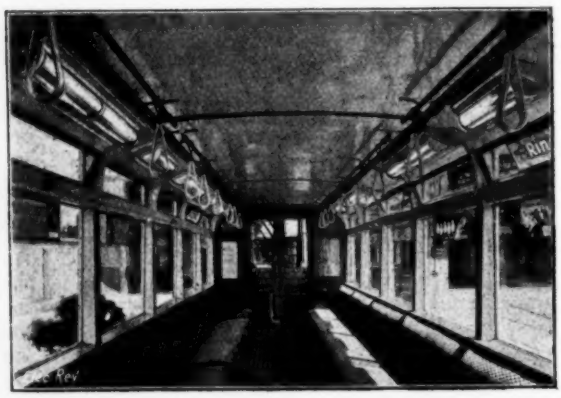


Fig. 1.—Improved Tramcar Interior and Novel Lighting Fittings.

it is anticipated that the life of the gear wheels will be in the neighbourhood of 15 years. The important feature of quietness has been gained by the use of these gears and light-weight motors, to which possibly the ball bearings, with consequent accurate alignment, have contributed.

Standard of Comfort.

The standard of comfort of travelling in London during recent years has become a very important factor where competitive forms of transport facilities are provided. It must be admitted that, from this aspect, tramcars generally have not made any real advance since they first commenced to run 20 years ago as a means of conveyance, with hard-wood seats and no real pretensions to comfort.

The internal appearance of the cars has received careful consideration and several have been entirely redecorated in harmonising colour schemes, such as light oak and white enamel, white and french grey, cream and brown, &c. The main experiment in seating has been with cross seats. Apparently, the London public has taken kindly to cross seats for the reason that, instead of looking at the passengers opposite, they can look out of the window in the direction of travel.

The designing of really comfortable cross seats for tramcars is complicated by the necessity for reversing the backs at the termini, a difficulty that has been got over by mechanically connecting the seat to the back so that the former moves forward slightly and also tilts so that the maximum comfort is obtained in either direction. For the first time in London the top deck has also been fitted with spring upholstered seats and backs, both top- and lower-deck seats being covered with moquette of pleasing blue and fawn colouring.

The lower saloon floor is covered with rubber ¼ in. thick instead of slats, and as the accompanying illustrations show, the lighting has been improved and additional lamps fitted, special attention having been given to the equal distribution of light and avoidance of glare; special ventilation arrangements

Fig. 2.—Improved Lighting and Cross Seats.

have been designed to give a clear current of air through the car, but avoiding draughts.

Amongst other details are open handgrips of washable material on hand straps. On the top deck hand rails are fitted to the roof for the convenience of passengers passing to and from seats. Special headlights are fitted which give ample illumination, the colour of the light being slightly yellow with a view to being effective in fog. Route numbers are fitted at the sides and ends of the cars and air-impulse bells are provided with push buttons distributed at convenient points.

This type of car's seating capacity is reduced by a total of six seats, but the tramcar, if it is to evolve out of its chrysalis state of being chiefly the workman's vehicle, must follow the lead of the omnibus and give the public comfort and attractiveness. The day has passed when utilitarianism is the only thing that matters, and the tramcar can do all that the omnibus does, and more, both in comfort and utility.

Quick acceleration and deceleration with a good average speed, luxury, and safety, are the present-day requirements of the London public, and to supply them costs money, but they can be considered cheap when compared with lost passengers.

The Municipal Tramways Association.

"Far from tramways being a back number I am of the opinion that there is no form of transport which can compete with the tramcar of the present day," said Mr. P. Priestley, manager of the Liverpool tramway undertaking, in speaking at a recent gathering at Plymouth in connection with the annual meeting of the managers' section of the Municipal Tramways Association. "It is a significant fact that during the course of a year the whole population of Great Britain is carried on the tramways several hundred times," he continued, "and I wonder if the man in the street who reads articles advocating the scrapping of the tramways realises what it would mean if the tramcars of the United Kingdom were really done away with."

These remarks were made in replying to the toast of "The Municipal Tramways Association," proposed by the Mayor, who remarked that the Association represented a capital expenditure of £71,000,000 and commanded an income of £26,000,000, mostly in coppers.

Mr. John Barnard, of Bolton, in proposing "The Plymouth Corporation Tramways," said that when he last visited the town eleven years ago the Corporation owned 34 cars and had 230 employés; to-day it was running 140 cars and 27 'buses, and had 900 employés. In 1914 the undertaking carried nine million passengers and the gross profits were £16,000; to-day the number of passengers was 38,000,000, the receipts £240,000,000,

and the gross profit £68,000,000, which was an answer to critics who asserted that municipalities were not capable of running tramways. Mr. Barnard firmly believed that transport in the big towns was as much the duty of the municipalities as was the provision of gas, electricity, and water supplies, and all they asked from the Government was that they should be put on an equal footing with private individuals.

Alderman W. H. Welsford, in replying on behalf of the Tramway Committee, said he remembered the first tramlines being laid in the streets of Plymouth 53 years ago. They had no fear for the future of the Plymouth tramway system while Mr. Stokes was at the head of affairs.

Mr. H. P. Stokes, who also responded, mentioned that Plymouth was the first town in this country to introduce street transport, and street transport by steam. So far as motor omnibuses were concerned, Plymouth had shown broad vision.

Mr. E. A. Earl presided over the dinner, during the course of which an excellent programme of music was rendered by the Plymouth Corporation Tramway Orchestra, directed by Mr. S. H. Palmer. The dinner was followed by a dance, and the conference, which met for the first time in the West of England, was attended by the managers of eighty tramway undertakings of the large towns of Great Britain and Ireland. It opened with a civic reception by the Mayor and Mayoress of Plymouth, Alderman and Mrs. R. W. Winnicott, and among the visitors were two from Australia, Mr. P. J. Pringle, of the Victoria Electricity Supply and Tramway Co., and Mr. Strangward, of Melbourne.

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

Portable Meter and Service Switch Cabinet.

Particulars are given in the *Electrical World* of a portable meter and service switch box made by the DAYTON POWER AND LIGHT CO., for outdoor emergency or temporary use. The cabinet is made in sizes suitable to carry installations of up to 400 A capacity, and is supplied equipped, wired and ready for use. The cabinet is made of wood and has a suitable roof and double doors, one at the top for the meter and the other at the bottom for the service equipment. Suitable weather-proof connections are made for the outlet wires to both the supply and consumers' mains. The service switch is of the safety type, with the main fuses separated from the consumers' fuses and sealed from access by the consumer. The service switch is operated by an external handle which is accessible to the consumer.

An Automatic Electric-Buoy Lamp.

The Venner-Dyke automatic electric-buoy lamp illustrated in fig. 1 which is made by MESSRS. VENNER TIME SWITCHES, LTD., 45, Horseferry Road, Westminster, London, S.W.1,

Fig. 1.—The Automatic Electric-Buoy Lamp.

Fig. 2.—Shade for Table Fitting.

has been designed principally for use on cable buoys in connection with the repair of submarine cables. The lower casing is of heavy gauge Manchester plate. It contains a 60-Ah, 4-V storage battery of 0.5-A discharge rate; and a "BF" type Venner time switch with an 18-day clock fitted in a cast metal box fixed to the underside of the closure plate which is held down by 12 brass bolts and nuts, a rubber gasket being used to make the joint watertight. The closure plate carries a 5-in. dioptric lens on its top side, in which are the electric lamp (2 W) and the lamp holder. A watertight, screw-down switch is also fixed outside the closure plate and is arranged in series with the time switch so that the lamp may be kept from being switched on when not required. Except the battery, the whole of the electrical equipment may be lifted with the container cover in one piece. By using special crosstrees provided for this lamp, its attachment to the buoy-staff takes only a minute or so, no lashings being necessary, and to facilitate the attachment, two brass lugs are provided at opposite diameters on the bottom rim of the container, and a handle on the top closure plate above the lens.

Reciprocating Switch with Moulded Composition Cover.

The latest product of the HART MANUFACTURING CO., 76 and 77, Rochester Row, Westminster, London, S.W.1, is the "Diamond H" switch fitted with a black moulded composition cover, illustrated in fig. 3. It has been designed to meet

Fig. 3.—Reciprocating Switch with Moulded Composition Cover.

Fig. 4.—The Electric Tap.

the demand for a shockproof switch for use on electric cooking apparatus, &c., and it entirely obviates the necessity of earthing the switch cover. The cover is strong; it is claimed that it will withstand a 10-ft. drop test, has a very high heat resistance, and is absolutely non-hygroscopic. The switch is of the 3-heat type, and the indications are sunk into the face of the cover and filled with white compound, giving a distinctive result.

The moulded covers are being supplied in 7½- and 10-A sizes for 3-heat switches, and for 10-A single- and double-pole reciprocating switches. The switch has a quick action and is provided with a white porcelain arrow-indicating handle.

An Electric Tap.

The accompanying illustration, fig. 4, is of an electric tap which is being marketed by MR. ALAN WRIGHT, Sentinel House, Southampton Row, London, W.C.1. The tap is designed, it is claimed, to give satisfactory results at temperatures between 70 deg. and 140 deg. F. and regulation between these limits is easily obtained by turning the knob at the top of the tap. The loading is 2¼ kW.

New Designs in Lamp Shades.

The illustration herewith, fig. 2, is of one of several types of lamp shades, marketed by the EFFICIENCY LAMP SHADE CO., 3, Took's Court, Furnival Street, Holborn, E.C.4. These all embody a somewhat unique design of hinged flaps which enables the glass panels to be instantly removed for cleaning or replacements and renders the insertion of transparencies and stencilled or written advertisements a simple and quick operation, without removing the shade from the lampholder. Another important feature is that the glasses are standardised and interchangeable, being made in two sizes, 6 in. by 4 in. and 6 in. by 5¼ in. The shades are made in varying designs of the pendant, bracket and table fitting types and the glass panels can be supplied with any lettering, artistic design, trade mark, &c. The fitting illustrated is fitted with ornamental top and mounted on a silver oxidised standard for table use.

Two New Quick-make-and-Break Switches.

Two recent productions of MESSRS. THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, taking the form of quick-make-and-break switches, are shown in the accompanying illustrations. The suspension switch, fig. 5, is made in both one-way and two-way patterns; it is of robust construction and provided with a rapid movement. A novel feature in the design is the provision of black and white buttons on the pressel bar, for indicating whether the switch is on or off. This switch is claimed to be capable of effectively controlling 3 A at 250 V.

The " straight-through " pattern, fig. 6, is specially designed for insertion in the flexible of toasters, irons, and similar portable domestic appliances, enabling them to be controlled in the most convenient manner. This type of switch is very desirable, and becomes almost a necessity where any particular piece of apparatus has no closely adjacent method of switch control, such as, for example, an iron being used from an ordinary lampholder. The movement in this pattern is similar to that in the one-way and two-way switches, and is claimed to be capable of carrying currents up to 3 A at 250 V.

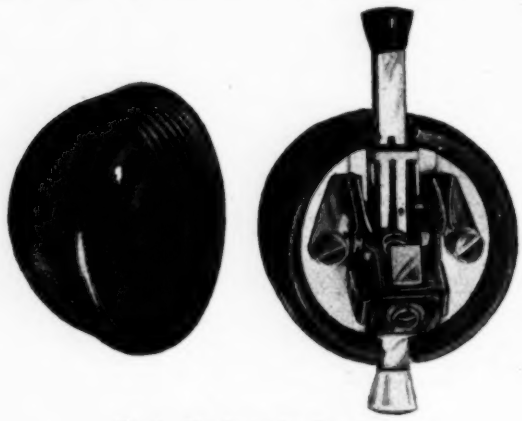


Fig. 5.—The Suspension Type Switch.

The cases of both switches are of well seasoned hardwood (lignum vitae), and can be supplied in either the standard polished finish or white enamelled. They present a neat appearance, and their overall dimensions are no larger than those of the old " flow make " type.

Fig. 6.—The Straight-through Type Switch.

South African Municipal Electrical Engineers.

Review of the Proceedings at the Sixth Convention.

WE have received a copy of the proceedings of the sixth Convention of the Association of Municipal Electrical Engineers of South Africa, held at Durban, Natal, from December 8th to 12th, 1924.* In the address of the retiring President, Mr. G. H. Swingler (Cape Town), reference was made to the inquiry by the Association early in 1924, into the vexed question of the allocation of profits made by electricity undertakings to the relief of the general rates. It was reported that the Electricity Department of the County Borough of Halifax had, during the course of its existence, contributed a net amount of over £90,000 to the relief of the rates, and because of this, there was an overdraft on the revenue account of £98,000, and the Department carried forward a deficit on revenue account of £36,000, against which there was a reserve fund amounting to only £1,800. The Halifax Corporation had, therefore, not only relieved the rates from the profits made by the undertaking, but had mortgaged future profits to the extent of the deficit. The case was an extreme one, but it was thought that the views of other undertakings on the matter would be of interest. A questionnaire on the subject was sent to a number of undertakings, and out of 119 replies received it was found that only 46 had received moneys at one period or other from the rates to make up deficiencies. Out of the 119 replies, eight were in favour of relieving the rates from electricity profits while every other reply was against such a policy. The President suggested that it would be to the benefit of the industry and the towns generally if it were made compulsory by law for all undertakings to be operated in a similar manner with regard to profits as applied in the case of the Commissioners' undertakings.

In his Presidential address, Mr. John Roberts, M.I.E.E. (Durban), in referring to the work of the Electricity Supply Commission, said that he hoped that the Commission would not adopt a too rigid control of new enterprises or insist on a uniformity of plant and method. Electrical machinery, as well as systems of supply, had been characterised by its great diversity of type. The best only had survived, and it was greatly due to the absence of central government control, which had resulted in a practical trial having been given to so many different methods, that the modern power station and distribution system to-day had evolved to the high state of efficiency and reliability it had reached.

Mr. JACOBS (Electricity Supply Commission), in reply to the President's address, said that the engineers of the Commission recognised that the development of the electric generator and prime mover to their present-day state of efficiency had been a slow process. They had not got to the end of that development and any new undertaking in connection with which the Commission might be consulted as to its economic possibilities, in so far as it complied with the Commission's idea of its duty, would be subject to no limitation of development.

A paper was read by Mr. Roberts and Mr. T. C. Shearer (Chairman, Durban Electricity Committee), on the " Control of Municipal Trading Undertakings." The authors suggested that the private company possessed an advantage over the municipality in having a more direct and simple organisation, also that the present system of municipal control entailed such an enormous amount of work by councillors, most of it concerning comparative trivialities, that busy men grew impatient at the waste of time and gave up in disgust. They suggested that the work of the Municipal Council should be divided among six separate executives, with three councillors upon each, and that the practice of the Legislative and Provincial Assemblies should be followed by payment of these executives to the extent of £200 to £300 per annum per member, amounting to the payment of councillors. Each of these executives should be given full power to carry out the Council's instructions.

After a lengthy discussion on " Standard Supply Pressure," a resolution was carried, to the effect that the Convention approved of 220 V as the uniform standard pressure at consumers' terminals for lighting supply. (In the case of 3-phase this pressure was to be that between each phase and neutral.)

Mr. H. A. Eastman (Cape Town) read a paper dealing with the commercial development of electricity undertakings, in which he reviewed generally the progress of the electricity undertakings throughout the Union with particular attention to installation work, which culminated in the following resolution being unanimously carried :—

" That the attention of the various Municipal Councils owning electricity undertakings be directed to the advisability of calling the attention of the Architects' Associations in their district, to the necessity of embodying in their specifications the provision of suitable and adequate accommodation in all buildings for the installing of the Electricity Supply Authorities' service equipment."

After a discussion on the paper by Messrs. Roberts and Shearer, concerning the question of contributions to the relief of rates, the following resolution was carried unanimously :—

" That this Convention of Municipal Electrical Engineers reaffirm the following resolution adopted at the 1917 Convention in regard to electrical contributions to the relief of rates and that the various municipal councils in the Union of S.A. owning electricity undertakings be advised accordingly.

" 1. That all charges arising between different departments of a municipality should be based on standard tariff charges where such exist, and in the absence of such standard charges should be based on the net cost of services given or received.

" 2. That we are of opinion that it is unsound policy as militating against the successful financial operation of municipally-owned electrical undertakings to allocate net surplus profits for the relief of rates or for municipal funds, or to make indirect charges so as to unfairly reduce net surplus profits.

" 3. That the rapid introduction of new and improved machinery for the production of electricity renders it imperative that every electricity undertaking shall set aside out of its net surplus profits an adequate amount to write off obsolete plant.

" 4. That the only legitimate outlets for net surplus profits are the building up of an ample obsolescence fund, and the reduction of charges to the consumer in order to encourage the use of electricity."

* See ELEC. REV., January 23rd, 1925; p. 130.

Pulverised Fuel.

By DAVID BROWNLIE, B.Sc.

(Abstract of a Paper read before the MANCHESTER GEOLOGICAL AND MINING SOCIETY (INSTITUTION OF MINING ENGINEERS).)

THE paper deals with recent developments in the use of pulverised fuel as applied to steam generation, briefly describing pulverised fuel installations, and the bearing of pulverisation on the subject of low-temperature carbonisation. It suggests to the colliery companies the adoption of low-temperature carbonisation at the pit head.

The first large boiler plant installation in Great Britain with pulverised fuel was at the Hammersmith electricity station, the original order for a "Holbeck" equipment for one boiler having been placed early in 1919, and the plant started up in December, 1920. Two more boilers fitted on this principle were set at work in April, 1923. It is unfortunate that detailed performance figures of this installation have apparently never been published, but it is stated the plant has been a success. In one comparative test with this pulverised fuel equipment there was shown, as against mechanical stoking, an advantage of 16 per cent. increase in thermal efficiency which is equivalent to £13,000 per annum.

To the mining industries the most interesting pulverised fuel fired power station is the 300,000 kW station at Cahokia, on the Mississippi, which belongs to the Union Electric Light and Power Co. and supplies the town of St. Louis. In this station "Lopulco" plant was adopted largely because of the difficult character of the cheap low-grade Illinois (Belleville) local fuel, which is an almost impossible material to burn at any reasonable efficiency with mechanical stoking, but nevertheless the boiler plant efficiency with pulverised fuel was guaranteed at 85 per cent. for test conditions.

The largest pulverised fuel equipment at present in operation in Europe is at the works of the Société Anonyme Ougrée-Marihaye, Ougrée, Belgium. It consists of Raymond mills and the "Quigley" system of handling the pulverised fuel by means of compressed air containers at about 70 lb. per square inch pressure, "shooting" the charge to the burner bins, the total length of the conveyor pipe circuit being 2,300 feet and the capacity from 46 to 80 tons per hour. Both metallurgical furnaces and steam boilers are supplied, the capacity being 33 tons of coal per hour. In this case the degree of pulverising is excessively fine, 97 per cent. through 100 mesh and 84 per cent. through 200 mesh.

The modern vertical gravity coal dryer on the "Wood" principle was operated experimentally at the Oneida Street station of the Milwaukee Electric Light & Power Co. for the two years 1921-1922, and the first large installation was that at the Cahokia station, whilst to-day the principle is in operation or being installed at Cleveland, Trenton Channel, and many other stations in the United States, at Vitry and Gennevilliers in Paris, and at Willesden, St. Pancras, Birmingham; and Derby in Great Britain. It consists of the use of a comparatively small vertical cylinder placed between the crushed coal bunker and the pulveriser containing inside two louvred pipes or narrow diameter cylinders, the coal passing downwards by gravity as taken away by the pulverisers underneath.

Part of the hot exit chimney gases, roughly about 10 per cent. of the total, equal to 3 lb. of gas and air per 1.0 lb. of coal, are taken by means of a fan and trunking, usually mixed with air to give a temperature of about 215 deg. F., and circulated continuously through the dryer back to the chimney again. The total power required is only about 3 kW per ton of coal, say, equal to 0.15 per cent. of the steam production of the plant.

The latest development of the continuous vertical gravity dryer is the use of air combined with exhaust steam heaters instead of air mixed with hot flue gas. The heaters are on the lines of the ordinary gilled steam radiator and are placed in the vertical drying cylinder, whilst the steam passed through them is either the exhaust of any convenient steam-driven auxiliary plant or "bled" specially from the turbine. The hot condensed water is returned to the boiler plant so that the dryer really functions as a condenser in which the heat is usefully employed in drying coal instead of being lost in the cooling water. In this new type of dryer about 30 square feet of heating surface per ton of coal per hour is required for every 1 per cent. moisture, whilst the amount of air passing through is about ¼ that of the air and waste heat dryer; that is, 1 lb. of air per lb. of coal. This is because the air from the boiler house is moderately dry and does not contain already a large amount of moisture as in the case of hot flue gases.

Fine grinding, such as 65 per cent. through a 200-mesh, is unnecessary, provided that uniform particles are obtained, say, 95 per cent. through 100 mesh. Roughly speaking, with modern mills and average fuel 90 per cent. through a 100 mesh is equal to all through 50 mesh and 70 per cent. through 200 mesh.

All kinds of refinements are being continually introduced. At Lakeside air-cooled walls of much lighter construction have been adopted with a 4½-in. patent brick ("Silocel") outer wall lined internally with steel instead of the heavy brickwork usually employed. The water screen is continued as usual, but the ash pit at the bottom slopes downwards at an angle of 38 deg., as compared with the previous flat shape, so as to facilitate the continuous discharge of the ash to the conveyor at the bottom. Another refinement is a housing over the outside of the arch setting and drawing over it the 10-15 per cent. of cold air required for combustion, which is passing to the adjustable-speed fuel feeders supplying the burners. This raises the cold air to about 75 deg. F., cooling the arches without wasting any heat.

One of the most remarkable of later inventions is the water-tube or "fin" wall, the invention of Thomas E. Murray, and first applied about 12 months ago at the Hell Gate power station, New York, in conjunction with multiple retort mechanical stokers. Essentially the principle consists in constructing the two side walls of the combustion chamber and the back wall as well, if necessary, of 4-in. steel tubes placed at 7-in. centres. To the side of each tube is welded a projecting steel plate or fin, one of which is 2½ in. and the other 1¾ in. from the tube surface. These plates or fins overlap, so that the wall is built up of 4 in. tube and 3 in. steel plate. The feed-water circulates through the tubes, and the result is an enormous increase in the net heating surface of the boiler next to the combustion space for the absorption of radiant heat, and remarkable results have been obtained at Hell Gate, up to 92.7 per cent. boiler plant efficiency, with mechanical stoking, by the use of this appliance.

One of the most striking results of pulverised fuel firing has been the size of water-tube boilers that is rendered possible. It is possible with one boiler for no less than 400 000 lb. of water per hour to be evaporated comfortably, and the Cleveland and Trenton Channel boilers will give this figure for long overload duty.

The flexibility of pulverised fuel firing has made possible the almost completely automatic boiler plant. The entire control of the working of a steam boiler from a distant switchboard was first developed at the Ford plant, and there has now been developed automatic control in which the rate of flow of the pulverised fuel and the air is controlled electrically by means of steam meter mechanism, which is operated by the actual flow of steam in the pipes. This regulates both the pulverised fuel feeders and the dampers, being so arranged that the relative proportion of fuel and air always remains constant for maximum efficiency.

The continuous thermal efficiency of steam generation that is being obtained by means of pulverised fuel firing can only be described as a revolution. The guarantees alone in a number of cases are over 86 per cent., whilst at Cleveland 87 per cent. is being obtained, with as high as 92.9 per cent. for single 24-hour tests.

The utilisation of refuse fuels is of importance to the colliery industry, and the Cahokia plant is therefore of particular significance. Pulverised fuel has enabled us to take practically any kind of fuel, except very low volatile anthracite and coke, and burn it at the highest efficiency, over 80 per cent. continuously, in any required amount so as to give in water-tube boilers an evaporation equal to the normal figures with good-class coal. That is to say, if a colliery had material of 50 per cent. ash and 25 per cent. water contents, it could still be utilised in, say, a 50,000 lb. per hour evaporation boiler and give this evaporation merely by increasing the amount of fuel passing through the burners. Mechanical stokers will not do this to the same extent, because they become clogged up with ash and clinker and all kinds of complications occur, such as the volatile content and the sulphur.

At the present time a "Lopulco" plant is being installed at the McCalls Ferry on the Susqehanna River, for the Pennsylvania Water and Power Company, where it is intended to burn anthracite refuse dredged up from the Susquehanna River above the dam. This material averages in the dry condition 15 per cent. ash, which includes some sand, and has about 4½-5 per cent. volatile matter. Another low grade fuel which is to be burnt by this method is Texas lignite, a plant now being in course of erection for this purpose in Trinidad for the Electric Bond and Share Company. In this case the raw fuel averages about 28-30 per cent. moisture and will be partially dried down to 15-20 per cent. before passing to the furnaces, while the ash content is low.

The position is so lamentable that it is difficult to give the plain facts without appearing to exaggerate, but this country could save with the greatest ease from 40,000,000 to 50,000,000 tons of coal every year, that is to say, from £50,000,000 to £75,000,000, simply by improving already existing methods and without spending millions of money on super-power station schemes. Out of the 260,000,000 tons of coal raised in Great Britain, about 75 per cent., that is, 195,000,000 tons, is consumed at home, apart from marine work. Of this something like 90,000,000 tons is used for stationary land boilers, and it will be remembered that the 58 per cent. average net working efficiency means that 20,000,000 tons every year could be saved in this direction alone, since the efficiency of boiler plant in general ought to average from 72.5 to 75.0 per cent.

The average hardness of the boiler feed water in Great Britain seems to be about 11 deg., representing 2,000 tons of scale a week deposited in the boilers, and probably a loss of 5,000,000 tons of coal per annum. Lack of superheating, efficient covering of steam pipes, including the flanges and condensation losses in general, probably represents another 5,000,000 tons. Many of the operations carried out in the iron and steel industries are so inefficient that less than 10 per cent. thermal efficiency is commonplace, in spite of the fact that producer gas firing would give 20-25 per cent. The author mentions two large iron and steel concerns that were squandering 500 tons of the best-quality coal per week on the boiler plant alone.

The colliery industry cannot expect that Great Britain will go on squandering 40,000,000 tons of coal every year, and pulverised fuel firing is a significant warning of this fact. It is suggested that the colliery concerns of this country should co-operate and concentrate on research and investigation work on low-temperature carbonisation and similar methods for the scientific use of raw coal.

Legal.

Stoller v. Davidson & Co.

At the Whitechapel County Court on July 29th, Mr. A. J. Stoller claimed the sum of £3 15s. 6d., representing the value of an accumulator which, it was alleged, was destroyed by fire while in the defendants' possession being charged. Judge Cluer pointed out that the plaintiff would have to prove negligence, and the latter held that leaving accumulators on charge at night unattended was negligence. The Judge, however, would not agree to that. He said that a point of law was involved which he would have to inquire into, and reserved judgment.

J. & M. Stone v. McCalla.

In the Lambeth County Court, on July 28th, before Judge Parry, Messrs. J. & M. Stone, 373, Brixton Road, S.W., electrical engineers, sued Mr. H. McCalla, Brixton, S.W., to recover £16 1s. 6d., for work done and materials supplied for the repair of the defendant's radio set.

Mr. Kauffman, in the employ of the plaintiffs, said that the firm supplied the defendant with a "Fellophone" valve set, in about 1922. There were no complaints until in 1924, when some new things were put into the set, but during that time they charged the accumulators.

Defendant said that he paid £66 5s. for the set, and was given no guarantee. The witness said that the firm did not give guarantees, as it did not get guarantees from the makers, but he went round to see that the set was in working order.

Judge Parry asked if the defendant had called anybody who knew something about radio, to give evidence for him. The defendant replied in the negative and the judge therefore adjourned the case for the defendant to bring an expert to state if the cost of the repairs was reasonable.

Miller v. The Scintillating Sign Co.

In the Chancery Division on July 28th, Mr. Justice Eve heard a motion in this case for leave to the Royal Bank of Scotland, the landlord of premises at Charing Cross occupied by the defendant company, to re-enter into possession. Mr. Beaumont, for the bank, said the motion was not opposed. The action was a debenture holder's action, in which a receiver of the defendants' property had been appointed. The receiver had written to say that he did not see how he could get out of the premises. The premises were let at £2,000 a year for the first year and £2,500 afterwards. The rent being in arrear, the landlord asked for leave to re-enter.

His Lordship granted leave as asked.

Tucker v. Wandsworth Electrical Manufacturing Co., Ltd.

Mr. Justice Tomlin, in the Chancery Division on July 29th, delivered his considered judgment in the action brought by Mr. John Bristow Tucker, of the firm of Tucker & Co., of Solihull, Birmingham, against the Wandsworth Electrical Manufacturing Co., Ltd., of Ludgate Hill, Birmingham, for an injunction restraining an alleged infringement of a patent relating to improvements in electrical switches. The defendants denied infringement, and alleged that the patent was invalid. (See Elec. Rev., July 10th, p. 53; and July 17th, p. 119.)

His Lordship said that electrical switches were made in various forms, the three principal being the rotary, tumbler, and knife-blade types. All these might be made with the quick make-and-break action whereby snap action was obtained, which produced rapidity of movement of make-and-break and adequate separation between the contact arm and the contact points, thus excluding danger of arcing. The plaintiff's first claim was for an electrical switch adapted to operate by quick make-and-break action by a compression spring element pivotally co-operating, on the one hand, with the contact arm, and, on the other, with an operating member, which member was utilised also for positively displacing the contact arm in the operation of make-and-break throughout the entire stroke as distinguished from positively displacing it only in the initial part of the stroke. The second claim was for a specific tumbler switch. The inventor did not limit his invention to any particular form of switch, though his drawings did not extend beyond the tumbler switch form. Switches had, in fact, been made in accordance with the drawings, and there had been a large demand for them. They were good switches, and their utility was not questioned. The attack on the validity of the claim was based on prior specifications, the number of which was reduced to three, *viz.*, Rose, Cox, and Crabtree, prior user of Rose, and common general knowledge. It was admited that the first claim was not limited to tumbler switches and, having regard to Cox's patent and existing common knowledge as to the idea of positive actuation throughout the stroke of the contact arm, he did not think the plaintiff's first claim was valid. As to the second claim—for a tumbler switch—upon the material which he had before him, he had come to the conclusion that it could be supported. Cox's switch seemed to be substantially different in design, and it remained to be considered whether the defendants' switch was an infringement of this claim. It was admitted that, with one exception, it could not be distinguished from the plaintiff's switch. It was true that the spring was of the push compression kind instead of pull compression, but the difference emphasised by the defendants was the fact that in a groove on the operating member there was a slide containing a small compression spring. It was said that the slide constituted an intermediate integer between the spring element and the operating member, and therefore the spring element was not positively co-operating with the operating member. In his opinion the slide element was an integral part of the operating member, and the spring element was pivoted on the operating member. The result was that the action succeeded with regard to the second claim, and there would be a proper injunction and an inquiry as to damages. The defendants must pay the costs, except so far as they were increased by the first claim, and the defendant's costs, as thus increased, must be paid by the plaintiff. There would be the usual set-off.

He granted certificates in respect of five particulars of objection, and agreed that the operation of the injunction should be suspended if the appeal was proceeded with speedily.

Reviews.

Practical Water Power Engineering. By W. T. Taylor, M.Inst.C.E., M.I.E.E. Pp. vi+270; figs. 33. London: Crosby Lockwood & Son. Price 36s. net.

Certain branches of engineering lend themselves less readily than others to exact quantitative treatment and consequently depend, for successful practice, very largely on the experience and judgment of individuals. Where the data, on which a design must be based, are difficult to obtain with exactness and the considerations to be weighed are numerous and conflicting, the application of hard and fast rules is impossible and the personal element is all-important.

Such a subject is that of "Water Power Engineering," and the position is aptly described by Mr. Taylor in the following terms (p. 147): "One of the characteristics of hydro-electric work is that it is almost futile to lay down fixed laws. . . . Each particular case must be governed by its own law—whether it be the catchment, the stream, the developed waterways and plants, or the power load."

In such a subject the existence of sound text-books is a matter of great importance and the difficulty of writing them is correspondingly great. To produce a treatise which will present a clear account of the somewhat indefinite principles involved and their application in practice is no small matter. Mr. Taylor has, however, succeeded admirably in this difficult task and has at the same time managed to steer clear of the danger of overburdening his book with the numerous scanty descriptions of existing installations, which make so many "practical" treatises little better than a sketchy encyclopædia or a collection of extracts from manufacturers' catalogues. This book, which is based to some extent on articles which appeared previously in the Electrical Review, is also free from the tendency to reiteration and lack of unity that often characterises books founded on a series of separate articles.

The subject of "Water Power Engineering" can be roughly divided into four branches: the study of the source of supply; the transport of the water to the power plant; the conversion of hydraulic into electric power; and the transmission of the electric power to the place of utilisation.

The first of these divisions is undoubtedly the one which presents the greatest difficulties. The only satisfactory basis for estimating the quantity of water available is a complete set of observations on stream flow extending over many years and it is seldom that these are available. Even where adequate rainfall records exist there still remains the problem of deducing therefrom the probable run-off in the catchment area. On pp. 26 and 27, Mr. Taylor lists twelve methods which may be used to express the relationship between rainfall and run-off (and these do not include all the formulæ that have been pro-

posed). These hydrometric questions of rainfall, run-off, storage and stream flow are dealt with very thoroughly in Chapters 1 to 5. As a matter of detail it may, however, be permitted to doubt whether the method suggested on page 78 for determining stream flow by adding salt in known quantities and measuring the conductivity of the water would give accurate results in view of the influence on the conductivity of the many possible impurities.

The design of conduits and pipe-lines is discussed in detail in Chapters 6 to 8. Numerous tables and charts are given to facilitate the computation of the formulæ required in this connection and should prove of assistance to the designer. It is to be regretted, however, in the case of these charts as well as those which occur elsewhere in the book, that the nomographic method of charting equations was not adopted instead of the system involving a network of scales. The very distinct advantages of the nomographic method, which does not yet appear to be used in this country as extensively as it deserves, lie in the small number of lines (one for each variable) constituting the chart, which is thus easily read. There is also a considerable gain in accuracy since interpolation is made along a scale rather than between curves, and furthermore it is possible to note instantly the change in one variable consequent upon changes in the others. It is to be hoped that this type of chart will be used when a second edition is contemplated.

A subject of special interest in relation to the possibilities of water power development in Great Britain is dealt with in Chapter 9, where the question of small water power plants with automatic control is discussed. Since there are few large water power schemes feasible in this country, future developments must largely take place on the lines of utilising the smaller powers. That there is room for such development is shown by the fact that Great Britain has developed less of her available water power (8 per cent. of the total) than any other large country except Russia. In the case of small water power plants automatic control enables operation costs to be reduced to a minimum and often becomes the determining factor in deciding whether a given scheme is economically possible. The development of these smaller water-powers can be gradually increased to meet the demand by linking up more plants with a central control station. The possibility of operating such plants in conjunction with large coal-using power stations is also a considerable advantage.

The question of high-voltage power transmission is dealt with in some detail in Chapters 12 to 14. Although this subject might at first sight appear somewhat removed from the scope of "Water Power Engineering," it is to be remembered that it is almost entirely due to the developments of the last thirty years in the possibilities of economical power transmission over long distances that many water power schemes have been rendered feasible, since many suitable sources of water power are situated at some distance from the place of power demand. It is therefore logical to assume that the water power engineer should be acquainted with the design and economics of transmission lines, as these form an integral part of any hydro-electric scheme which must be considered as starting with the rainfall in the catchment area and finishing at the place of consumption of the power generated.

On the whole, Mr. Taylor's book should be very welcome to those interested in hydro-electric engineering on account of its lucid exposition of fundamental principles and the application of them to the practical and economic problems involved.

A. J. V. UNDERWOOD.

An Outline of Automatic Telephony. By WILLIAM AITKEN, M.I.E.E., Assoc. A.I.E.E. Pp. 143; figs. 43. London: Ernest Benn, Ltd. Price, 5s. net.

This small handbook is written with the object of providing within a small compass a description of the various telephone systems in use in the world to-day. It will also be found to furnish an introduction to the author's large work "Automatic Telephone Systems."

There are, in all, ten chapters dealing with systems and apparatus, both self and power driven; and including the W.E. Co.'s rotary system and panel system, the Ericsson, Stockholm, system, the Director system, and semi-automatic working. Prominence has been given by the author to the details of the Director system because of its adoption in the London and other large areas. In this connection it is pointed out that "the student should realise that principles and fundamental features of one system are frequently applicable to the solving of problems in others," and hence the necessity for avoiding a too exclusive consideration of one system only.

There are no fewer than 42 illustrations throughout the text to assist the reader in obtaining a clear idea of the actual apparatus described, and to enable him to trace the various switching operations by means of circuit diagrams. In addition, a lengthy extract is given from a paper read by Col. T. F. Purves, Engineer-in-Chief to the Post Office, before the Institution of Electrical Engineers, in which an outline is given of the A.T.M. Co.'s Director system for London.

The book will be of great service to those who desire to have a suitable introduction to larger works dealing with automatic telephony—conspicuous amongst which is the author's own three-volume work—and will undoubtedly be useful for class work purposes to students who are taking the City and Guilds courses in telephony.

Low Temperature Distillation. By S. H. NORTH and J. B. GARBE. Pp. viii+216; figs. 40. London: Sir Isaac Pitman and Sons, Ltd. Price 15s. net.

An authoritative general treatise on this interesting and important subject is welcome, in view of the close attention that is being given to the better utilisation of our stores of coal, the provision of smokeless fuel, and the production of fuel oil within our own borders. That these problems will ultimately be solved we have no doubt, though much of the labour expended upon them in the past has proved unfruitful, yet we learn by failure as well as by success, and the authors, by giving the history of the subject and describing the earlier work as well as more recent developments, have done good service to the inventors of to-day. It is worthy of note that by low-temperature distillation the greatest yield of oil of good quality is obtained, and seeing that the use of oil as fuel is rapidly extending, whilst the natural supplies of oil are likely to be short-lived, the bearing of the matter on the production of energy with high economy is obvious. According to the authors, if low-temperature carbonisation became general (apart from gasworks and coke ovens, which consume 38 million tons per annum), 150 million tons of coal annually treated thus would yield at least 450 million gallons of motor spirit and 250 million gallons of crude oil, of which 50 per cent. is high-class Diesel oil, the result being an enormous reduction in the national coal bill and a great saving in subsidiary expenditures due to the burning of coal by the present wasteful methods.

The numerous systems projected or in operation are described and illustrated, the raw materials and the resulting products are discussed, and the possibilities of utilising lignite, peat, and shale are examined; and in an appendix a large amount of information in the form of analyses, &c., is given. As large users of fuel, electrical engineers are being led or forced by circumstances to study the nature and treatment of coal more and more closely, and the growing use of pulverised fuel is further stimulating attention to this subject, which is of fundamental importance in the production of energy by thermal methods. That they will eventually, either independently or in conjunction with gas producers, endeavour to use coal more efficiently and without loss of the valuable by-products, cannot be doubted, and this book should help towards that end.

French-English and English-French Dictionary of Technical Terms. By J. O. KETTRIDGE, F.S.A.A., A.C.I.S. Pp. xvi+1,137. London: George Routledge & Sons, Ltd. Price 50s. net.

This is a monumental work, and the work not of a symposium but of one man, whose industry must be inexhaustible—for the same author has already written a similar dictionary dealing with financial and business terms. His aim has been to cover all branches of engineering, as well as of the numerous departments of science upon which engineering is based, and he includes a method of telegraphic coding to enable any entry in the volume to be expressed by a 10-letter word with indicator and check. The dictionary gives the translations of 100,000 words and phrases, arranged alphabetically on a consistent and efficient system which facilitates reference, and the user need not be familiar with both languages—a knowledge of either is sufficient. Not only single words, but also compound words and phrases are dealt with, and where the meaning of a word differs in accordance with the application of the moment, a separate paragraph is allotted to each sense; thus the word "box" in the English-French section appears 43 times, *e.g.*, "box car," "box connecting-rod end," "box-coupling," &c. The author has been generous in his selection of phrases; thus under "fit" we find "fit in," "fit out," "fit up," and under "form," "form a favourable opinion (to)." "Lord Kelvin's mirror galvanometer" appears as an entry.

We cannot but admire the author's achievement, which represents the fruit of immense labour. It is true that, covering so wide a field, which bristles everywhere with technicalities, he could not be expected invariably to grasp the true meaning of an unfamiliar word—for example, "commutatrice," which does not mean "commutator"; and in so great a mass of words and phrases, the specifically electrical items appear to be comparatively scarce.

The word "self" does not appear as an entry in the French section, though it is used in a translation, and the word "mil" is absent from the English section. No doubt we could find many faults in so huge a target; but we could doubtless find as many merits, and we prefer to commend the work as a most praiseworthy attempt to deal with a problem which can never find a perfect solution.

Electricity Supply Costs and Charges. By H. M. SAYERS, M.I.E.E. Pp. 80; figs. 6. London: The ELECTRICAL REVIEW, LIMITED. Price 2s. 8d. post free.

The author of this book describes it as an "attempt to set out the general relations governing the cost of electricity supply and to suggest methods of detailing the costs in forms which afford guidance to a progressive policy"; and every reader of it, whether or no he agrees with all its conclusions, will congratulate the author on the thoroughness with which he has treated his subject. In the unfortunate absence of efficient facilities for generating electricity for stock and storing it, as water can be pumped into a reservoir, or gas fed into a gasholder for a limited number of hours a day at a constant rate quite unrelated minute by minute to the demand of the moment, electrical generating stations (to quote the author's

words once more) "do not on the average work at their capacity for six hours per day, but they have all the costs of keeping running for 24 hours per day, as well as the capital charges which might well be spread out over . . . [a greater] production." The book discusses with great minuteness every item of the cost as it affects and is affected by these peculiar conditions, and deals with the problem not only as it arises in the generating station but also as it concerns the much more difficult area of the distributing system. The author does not hesitate to suggest that it may touch controversial subjects, but, as he says, "dissent and discussion . . . imply thought and examination, out of which come knowledge and assurance"—a sentiment with which it is impossible to disagree, provided the dissenting and the discussing are done by the proper persons. There has been far too much said in public, that is, in the hearing of consumers, about costs and charges and tariffs. These matters are for discussion amongst those who understand them and those who ought to understand them, just as medical subjects are debated more or less behind closed doors and not with a gaping crowd of possible patients looking on. It is not necessary even for every person engaged in electricity supply or in electrical engineering generally to understand them; they are, in fact, the province of a special type of mind, the fortunate possession of a few who are engineers gifted with a sense of economics and with imagination in addition—the type of mind that thinks of saying, as the author does on page 77: "The sweet simplicity of Kelvin's law expresses a truth which the author would be the last to condemn, but the requirements of a road authority in respect to excavation and making good a cable route may easily swamp the benefit of conformity to that law, when reduced to the common denominator of £ s. d." Just as an accountant is brought in from outside to design a set of books for a business concern, so the engineer-accountant, a very highly cultivated expert, should be entrusted with the task of examining the particular conditions of an electric supply concern and of designing a method of recording, in proper form, the information required, as the author points out, before any intelligent prediction can be made of the effect of new load on costs and therefore of what charge should be made when the new load comes on, both for it and possibly also for existing loads. It is scarcely to be expected that so specialised a piece of work can be carried out by the ordinary station staff; and the more suitably it is done in the first instance, the more easily will it be kept going by the ordinary staff afterwards.

The book deals with costs and with charges in a general way rather than with tariffs in particular, but the bearing of these on the question of tariffs is obvious. It is essential somehow to get down to a simple and easily applied tariff; and it is impossible to have it changing frequently even though conditions change. It is exceedingly difficult, or let us say impossible, to devise a tariff logically and correctly applicable to every consumer; here, as so often, compromise is the solution, and the value of the book under review is that it is a contribution to the understanding of its subject that will lead to the best compromise because it shows how to take into account all the factors influencing it. There is ample evidence that it is the present cost of electricity that prevents its wider adoption for both domestic and industrial purposes; and the better the whole subject is understood by those who ought to understand it, the more ably will they convince those who ought to use electricity that it is to their interest to do so.

Of the book itself it may be said that it is well-produced, except perhaps for a rather awkward four-page section between pages 44 and 49, and except for the few misprints that seem inevitable nowadays in every book. They are not serious; but it may be suggested that in a reprint it would be useful if the four diagrams (pages 41 to 44) were redrawn so as to match each other in their scales, and if the zeros of both axes were shown (the latter comment applies also to figs. 5 and 6), particularly because the whole point of the diagrams is that the coal consumption is not zero for zero output, and this is not obvious in their present form.

The writer of this review has no connection with any supply undertaking except as a consumer alleged to be too modest in his demands; he is therefore one of the "gaping crowd of possible patients," and, as such, ought never to have seen the book at all. But he is grateful for it; some of us have an insatiable inquisitiveness. So one who has absorbed every word of the book with thanks for its clearing-up of many important points would say to any other who may have come with him to this end of the review: Go, and do thou likewise.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

490. "Continuous transmission of visual images by wire or wireless." L. H. Sensicle. January 8th, 1924. (236,464.)

5,633. "Manufacture of electric conducting and resistance material." H. Wade (Nederlandsch Technische Handel Maatschappij Giro). February 5th, 1924. (236,880.)

5,632. "Electric motors." Lancashire Dynamo & Motor Co., Ltd., R. S. McLeod, G. E. Mason, and W. Stansfield. March 5th, 1924. (Cognate application 8,218/24.) (236,609.)

6,128. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. A. Pollock. March 10th, 1924. (236,611.)

7,632. "Device for connecting electrical conductors and the like." Deutsche Gasgluhlicht Auer Ges. September 7th, 1923. (221,471.)

7,707. "Device for connecting electrical conductors and the like." Deutsche Gasgluhlicht Auer Ges. December 28th, 1923. (Addition to 221,471.) (226,770.)

7,758. "Cathodes for vacuum electric devices." E. Y. Robinson. March 26th, 1924. (236,615.)

8,478. "Method of fixing the caps of thermionic valves, electric lamp bulbs, and the like." P. V. Castell Evans and J. M. Longe. April 3rd, 1924. (236,618.)

8,482. "Electrical insulating material." E. B. Wedmore, W. S. Flight, and British Electrical and Allied Industries Research Association. April 3rd, 1924. (236,619.)

8,922. "Electrical operations of railway points and signals." B. H. Peter, L. H. Peter, and Westinghouse Brake & Saxby Signal Co., Ltd. April 8th, 1924. (236,640.)

8,977. "Transmission systems." Western Electric Co., Ltd. April 9th, 1923. (214,249.)

8,985. "Portable electric safety lamps." T. H. Baily and W. Evans. April 9th, 1924. (236,645.)

9,038. "Radio signalling systems." R. D. Bangay. April 9th, 1924. (236,647.)

9,039. "Means for obtaining negative resistance effects and for generating electric oscillations and radio receivers." H. J. Round and N. M. Rust. April 9th, 1924. (Cognate applications 9,040/24 and 17,733/24.) (236,648.)

9,048. "Sound amplifying conduits." J. S. Flizikowski. April 9th, 1924. (236,650.)

9,154. "Protective arrangements for alternating-current systems." British Thomson-Houston Co., Ltd., and A. S. Fitzgerald. April 10th, 1924. (236,656.)

9,187. "Railway signalling systems." Automatic Telephone Manufacturing Co., Ltd., and A. E. Hudd. April 10th, 1924. (236,660.)

9,232. "Electrical connector." E. W. Bonson. April 11th, 1924. (236,663.)

9,460. "Systems for the transmission of electromagnetic radiant energy." W. J. Mellersh-Jackson (A. Taylor). April 14th, 1924. (236,673.)

9,634. "Crystal detectors for wireless telegraphic or telephonic apparatus." F. K. Woodroffe and R. N. Dawson. April 16th, 1924. (Cognate application 28,488/24.) (236,678.)

9,849. "Electric cables." J. Delon and Compagnie Générale des Câbles de Lyon. December 29th, 1923. (226,771.)

9,851. "Telephone receivers and transmitters and the like electromagnetic instruments and the manufacture thereof." British Thomson-Houston Co., Ltd., and A. P. Young. April 17th, 1924. (236,680.)

10,024. "Wireless systems for communication between ships and the like." H. Leuner. April 22nd, 1924. (236,683.)

10,640. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd. September 17th, 1923. (222,079.)

10,858. "Telephone receivers." F. J. Hooper and W. H. Derriman. May 2nd, 1924. (236,691.)

10,940. "Thermionic valves or electron discharge tubes." Mullard Radio Valve Co., Ltd., C. F. M. Hayes, and L. Grinstead. May 3rd, 1924. (236,692.)

11,514. "Reclosing circuit-breaker systems." British Thomson-Houston Co., Ltd. August 8th, 1923. (220,275.)

12,159. "Diaphragms for use in sound-reproduction." J. Graham. May 17th, 1924. (236,699.)

12,417. "Substitute for batteries in radio receiving sets." P. B. Frost. May 21st, 1924. (236,702.)

13,742. "Crystal detectors for wireless receiving apparatus." B. Mather. June 5th, 1924. (236,711.)

14,717. "Construction of rotors for high-speed machines." English Electric Co., Ltd., and A. D. Sloan. June 18th, 1924. (236,717.)

16,236. "Loose couplings for use in radio reception." F. H. P. Monkhouse. July 7th, 1924. (236,726.)

17,420. "Electric cooking appliances." J. Lyons & Co., Ltd., and P. G. Douglass. July 21st, 1924. (236,735.)

18,445. "Motor-vehicle lamps." J. Lucas, Ltd., and O. Lucas. August 1st, 1924. (Cognate application 23,094/24.) (236,774.)

19,077. "Mountings for the terminals of selector switches." Western Electric Co., Ltd., and B. B. Grace. August 11th, 1924. (236,749.)

19,334. "Tiltable electric conducting liquid switch." Lurgi Apparatebau-Ges. March 6th, 1924. (230,406.)

20,022. "Magnetic separators." H. H. Thompson, A. E. Davies, and W. E. Box. August 25th, 1924. (236,758.)

20,407. "Electric power transmission." A. M. Taylor. April 28th, 1924. (Divided application on 221,304.) (236,759.)

21,401. "Cooling systems for thermo-electronic apparatus." British Thomson-Houston Co., Ltd. November 21st, 1923. (225,177.)

21,977. "Electric measuring apparatus." International General Electric Co. Inc. September 20th, 1923. (222,132.)

25,354. "Electrical conductors." M. J. Railing, C. E. Cutting, and F. G. Quance. October 24th, 1924. (236,786.)

25,556. "Electrical condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (236,788.)

27,120. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. November 13th, 1923. (224,905.)

27,139. "Electric contact plugs." Pathé Cinema Anciens Etablissements Pathé Frères. December 1st, 1923. (225,532.)

27,220. "Inductance coil plug." B. Ross. November 14th, 1924. (236,800.)

28,567. "Electron discharge devices." British Thomson-Houston Co., Ltd. February 19th, 1924. (229,634.)

28,878. "Zone poles for magnetic separators." P. C. Rushen (F. Krupp Grusonwerk Akt. Ges.). December 2nd, 1924. (236,808.)

29,430. "Filament supports for use in electric discharge tubes, incandescent lamps, and the like." British Thomson-Houston Co., Ltd. December 15th, 1923. (226,196.)

30,084. "Portable electrical rectifying devices." H. A. Gill (Deutsche Telephonewerke und Kabelindustrie Akt. Ges.). December 15th, 1924. (236,816.)

30,392. "Process for the production of a good contact surface for bonding the rails of electric railways." Siemens-Schuckertwerke Ges. February 15th, 1924. (229,269.)

30,871. "Electric motors combined with gearing." J. F. Monnot. December 23rd, 1924. (236,821.)

1925.

2,523. "Head-lights for vehicles." L. J. Bleret. February 2nd, 1924. (228,552.)

5,124. "Incandescent cathodes for Röntgen and like discharge tubes." Siemens & Halske Akt. Ges. February 26th, 1924. (230,067.)

5,758. "Electric drink-mixers." R. B. Gilchrist. March 3rd, 1925. (236,857.)

6,299. "Telephone systems." Telephone Apparat Fabrik E. Zwietusch and Co. Ges. Kommanditges. March 7th, 1924. (230,485.)

7,678. "Process for the manufacture of thermionic valves." Compagnie Générale de Télégraphie sans Fil. March 22nd, 1924. (231,194.)